WATER & SEWAGE WORKS

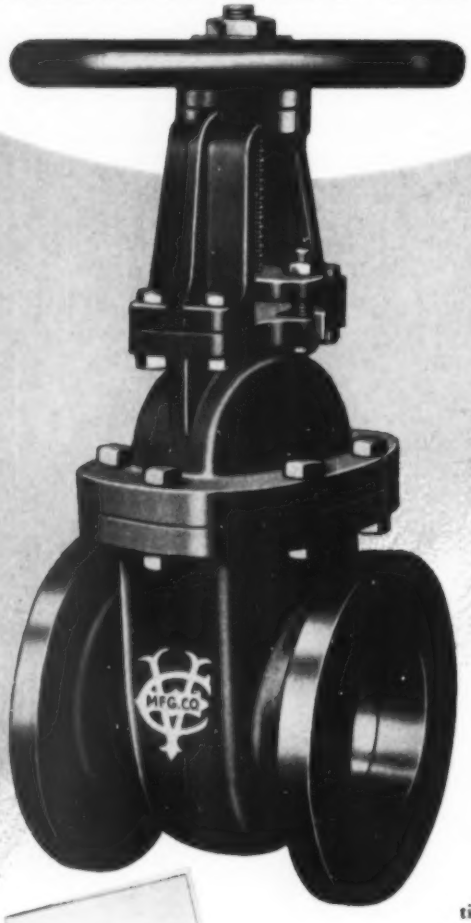
WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL

SEPTEMBER, 1953

San Diego Aqueduct Chlorinating Station . . .

71 mile conduit restored to full design capacity at critical time

How to make Your Specifications *Really Specific...* for Iron-Body, Bronze-Mounted Gate Valves



Take these 3 pressure-groups of valves for water works service:

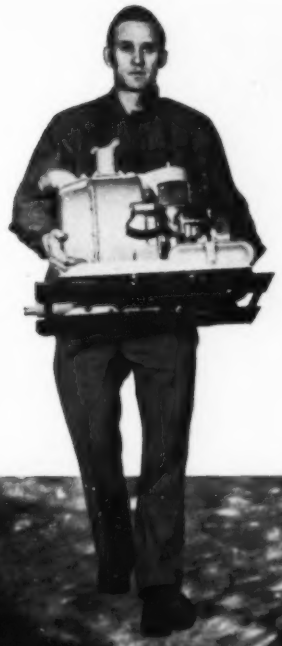
1. **50 lb. WWP — 100 lb. Test** } Usually for service above-ground
2. **150 lb. WWP — 300 lb. Test** } Usually for service above-ground
3. **150 lb. WWP — 300 lb. Test (AWWA Specs)** } Usually for service under-ground

For group 3, there are clear and complete AWWA Specifications. For groups 1 and 2, there are *no published specifications at all.* So, to assist engineers in their preparation of specifications for these 2 groups, Chapman engineers have "booked" *all* gate-valve construction details *which should be covered by specifications.* And *you* can have all this data on your desk by return mail . . . just . . .

SEND FOR THIS HELPFUL NEW FREE BOOK...

"Recommended Specifications for Iron-Body, Bronze-Mounted Gate Valves for Water Works Service" — This 36-page book will save you time — *time and again.* Write on your letterhead for a copy *now,* to:

The Chapman Valve Mfg. Co., Indian Orchard, Mass.



AS EASY AS THIS . . .

One man picks up a Homelite and puts it right where you need pumping, *quickly*. No trucking problems, no planking, no hauling, no pushing.

AS FAST AS THIS . . .

With the fastest possible self-priming, a Homelite is instantly at work . . . pumping out water at a rate as high as 15,000 gallons an hour.

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Where else can you find a pump so light, so easy to handle and so fast and dependable on the job. Light enough for one man to carry, a Homelite Gasoline Engine Driven Pump is big enough for any job. It primes fast. It pumps fast. It has a guaranteed 28 foot suction lift. And it keeps seepage automatically at strainer level . . . for better working conditions on the job.

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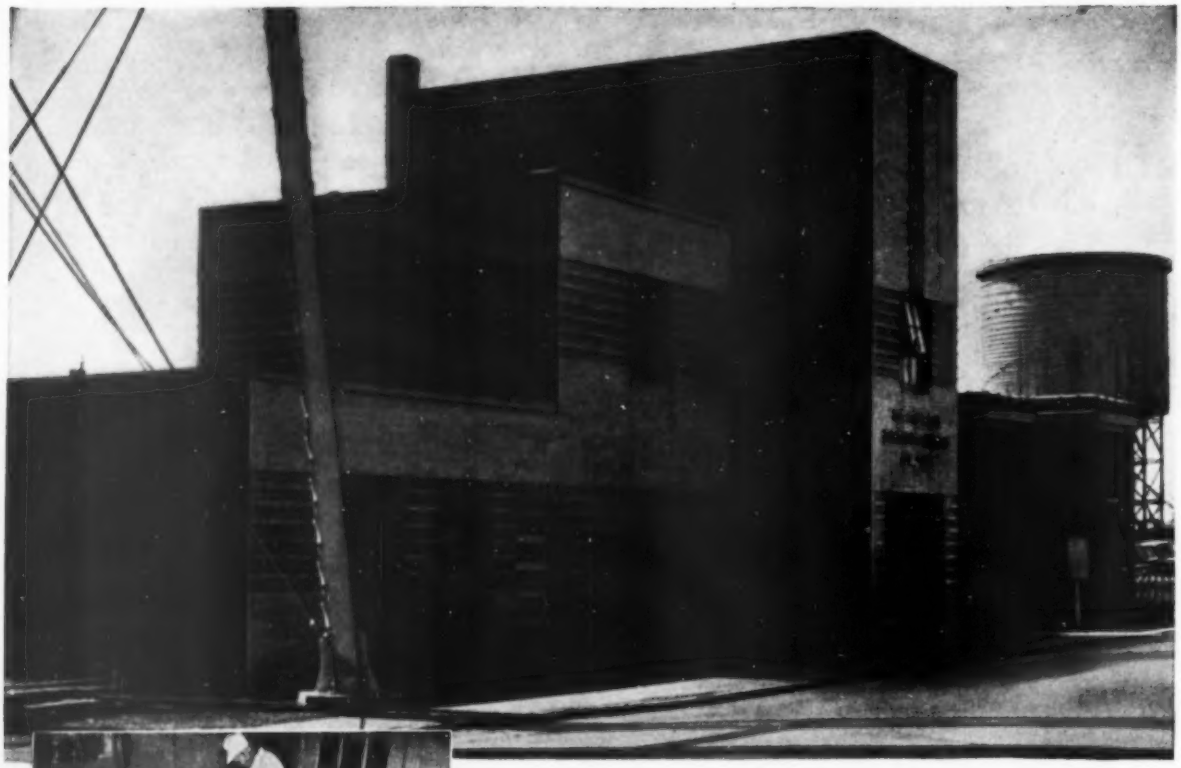
Canadian Distributors: Terry Machinery Co., Ltd., Toronto, Montreal, Vancouver, Quebec.



Staples' compact Permutit Precipitator has 400 gpm capacity. Softens hard well water, removes turbidity, iron, and manganese.

Two 8' x 9' Permutit Gravity Filters remove last traces of suspended matter, deliver a crystal-clear, softened water.

How *Staples, Minnesota gets soft, clear water*

Staples' well-water supply caused plenty of trouble . . . total hardness 275 ppm, alkalinity 200 ppm, iron 3 ppm, turbidity 30 ppm. To solve these problems, Staples turned to Water Conditioning Headquarters.

Now Mr. E. H. Klang, Supt. of the Water and Light Dept., reports the Permutit-treated water "very fine in all respects—very clear."

Permutit recommended the equipment shown at left, plus a carbonation tank. Turbidity is reduced to only 3 ppm . . . iron to 0.1 ppm. Hardness and alkalinity are reduced to specified requirements. Because of high Precipitator efficiency, each filter is backwashed only once a week for 20 minutes.

"The Precipitator has not given any trouble. The Permutit filter is one of the best . . . has been trouble-free," adds Mr. Klang about the Permutit equipment installed in 1939.

Free Technical Bulletins

Write today for full information on any water conditioning process or problem. The Permutit Company, Dept. W-9, 330 West 42nd Street, New York 36, N. Y.

WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS

PERMUTIT®

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WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT

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New Concepts of Tastes and Odors in Surface Waters ..... *Silvey*
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Published Monthly—subscriptions in the U.S., Canada and Latin America $2.00 per year; Foreign $3.00. Single copies 25c
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Destined to write a new page in cast iron pipe's history

Everybody knows that cast iron pipe has a history of more than 200 years of continuous service abroad and over a century in more than 45 cities in America. A record of economy and efficiency unique in engineering annals!

Yet today's *modernized* cast iron pressure pipe—centrifugally cast—is even more economical, even more efficient. It is tougher, stronger, more uniform in controlled quality. Where needed and specified, it is lined with cement mortar, centrifugally applied, resulting in a tuberculation-proof pipe with sustained carrying capacity, thereby reducing friction and pumping costs.

If you want the most efficient and economical pipe ever made for water distribution, your new mains will be laid with *modernized* cast iron pipe with either mechanical or bell-and-spigot joints. Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3.

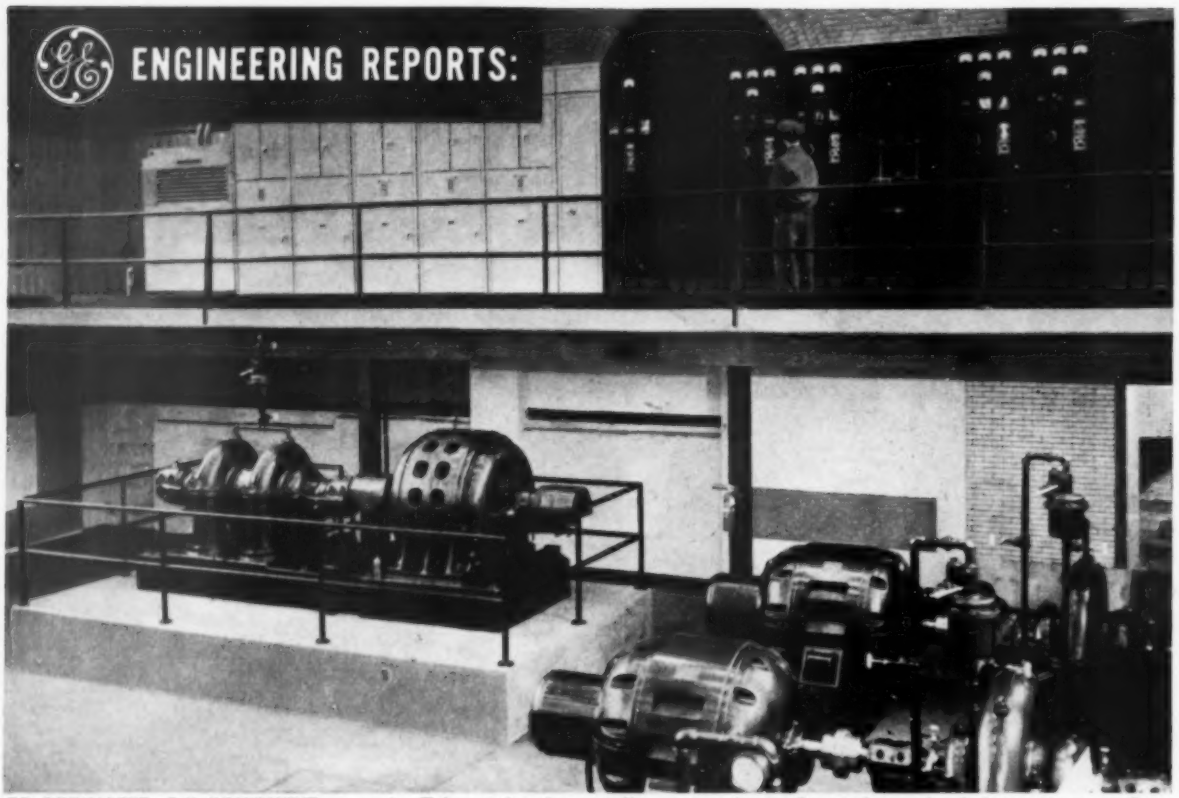
CAST Q IRON

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

Modernized **cast iron**

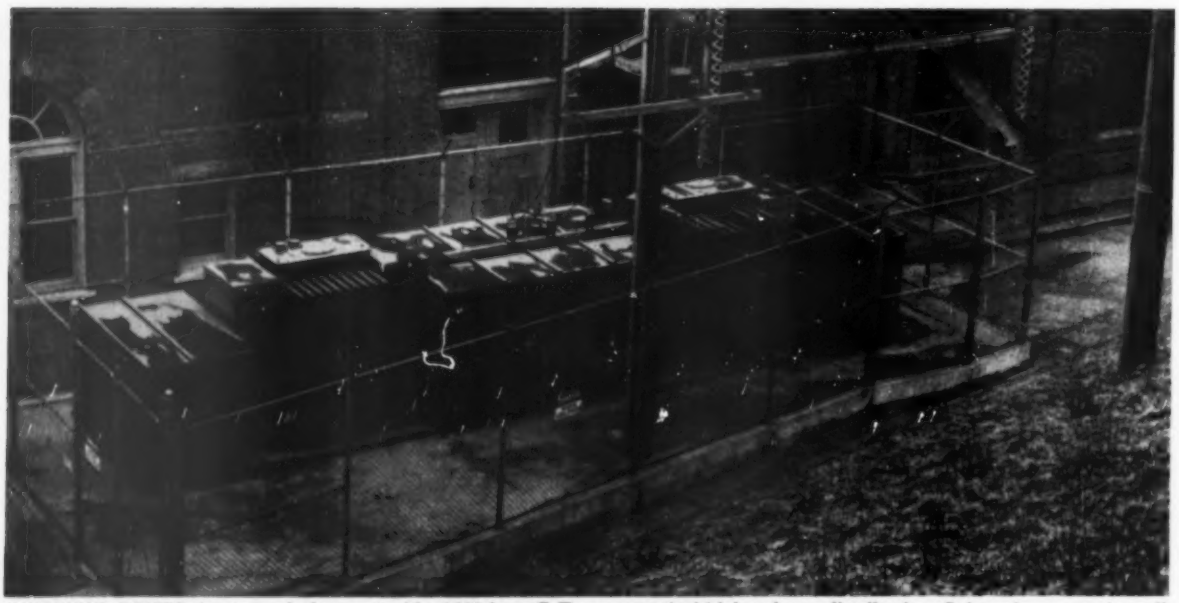
This cast iron water main, uncovered for inspection, is in good condition after over 110 years of service in Mobile, Ala.— one of more than 45 cities with century-old water or gas mains in service.

pipe for Modern Waterworks Operation



CO-ORDINATED G-E EQUIPMENT at main Erie station includes (bottom right) three 1000-hp 1200-rpm synchronous motors (two shown) driving DeLaval pumps rated 12,600 gallons per minute. Located on the balcony to save floor space are (r. to l.) metal-clad switchgear, Limitamp, compact load-center unit substations, and small-motor control center.

Erie looks ahead—triples main



INCOMING POWER is stepped down at this 1500-kva G-E master unit substation from 13,800 volts to 2400 volts for economical high-voltage distribution. Substation comprises all equipment needed between utility line and plant circuits.

PERSONNEL PROTECTION is provided by this G-E metal-clad switchgear assembly. Circuit-breakers—of adequate interrupting capacity—are easily removable to simplify maintenance.

CENTRAL OPERATING POINT for the plant is this G-E control desk, combining push buttons, indicating lights, and selector switches. Desk is conveniently located in pump room.

plant's water pumping capacity

Thorough system engineering cuts operating, fuel and maintenance costs—will pay for itself in 5 years

Acting now to meet future water-supply requirements, Erie, Pa., recently expanded its pumping facilities. General Electric application engineers—working closely with the city's engineering staff, Chester Engineers of Pittsburgh, consultants, and the Dravo Corporation's Machinery Division, contractors—co-ordinated the electric equipment for a modern, efficient system to replace old steam-driven units in the city's main plant.

Results: They tripled pumping capacity—from 20 to 60 mgd. They saved four-fifths the space formerly used. Five men can now operate the station instead of forty. In two years of 24-hour-per-day operation, no repair whatsoever has been needed, according to Supt. Maurice McMahan. And the cost of the installation will be completely repaid within five years by operating, fuel and maintenance savings.

This kind of G-E application engineering skill can help make your community's water-supply program pay off. For best results, call in your G-E Apparatus Sales representative early in the planning stage.

HOW YOU CAN ACT NOW FOR MORE WATER TOMORROW

Arouse public interest through showings of the new full-color movie, "Pipeline to the Clouds." It's part of G.E.'s *More Power to America* Water Supply Program. For more information, write on your letterhead for Bulletin GEA-5555 to General Electric Co., Section 666-77, Schenectady 5, N. Y.

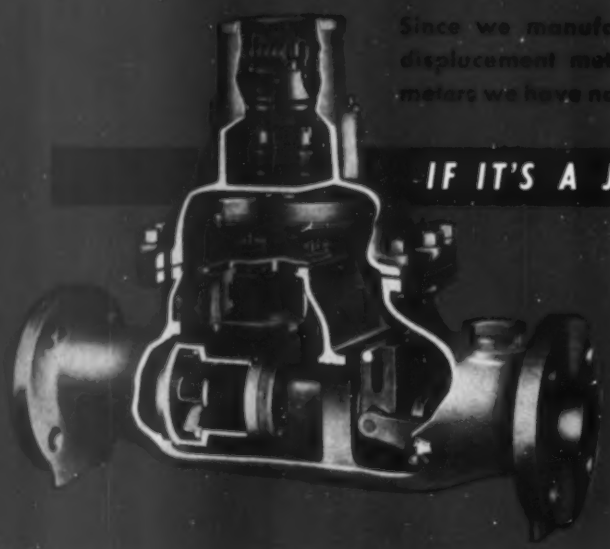
Engineered Electrical Systems for Waterworks

GENERAL ELECTRIC

WE HAVE BEEN ASKED...

ABOUT THE NEED FOR 2-INCH COMPOUND METERS

Since we manufacture both 2-inch positive displacement meters and 2-inch compound meters we have no axe to grind. But we say...



IF IT'S A JOB FOR A COMPOUND,

USE THE

ROCKWELL
Single Register
COMPOUND
METER

WHAT'S SO DIFFERENT ABOUT ROCKWELL COMPOUNDS?

1. **SINGLE REGISTER**—Eliminates errors in reading and adding together two registrations.
2. **NO CHANGEOVER POINT**—No lost registration that accounts for up to 15 percent in conventional types.
3. **LOW HEAD LOSS**—Due to straight through flow, pressure drop is only 5 psi at 160 gpm. A.W.W.A. specifications permit up to 20 psi.
4. **MORE ACCURATE**—Within normal test limits registration is held to within 1½ percent plus or minus. A.W.W.A. allows 3 percent plus or minus.

WHEN TO USE A 2-INCH COMPOUND METER

When accuracy over the entire range and maximum revenue is desired

In order to meet A.W.W.A. specifications, a 2" compound meter must measure at least 95 percent of the water at minimum test flows of ½ gpm. Displacement type meters need only measure 95 percent at 2 gpm.

When continuous flow rates are in excess of 32 gpm

The propeller unit in a 2" compound permits *continuous* operation at up to 54 gpm without excessive wear; intermittent operation up to 160 gpm. Displacement type meters are safely rated at only 32 gpm with intermittent flows up to 160 gpm. Thus the *continuous* rating of the compound is more than 60% greater than the positive displacement meter.

When lower maintenance costs, fewer service interruptions are wanted

At high speeds the measuring chamber of a positive displacement meter will suffer more costly wear than will the propeller chamber of a compound. And since both meter units in a compound always operate within normal capacity limits there can be no overspeeding to cause breakdowns and expensive service interruptions.

When in doubt about the type meter to use, ask the Rockwell service engineer.

ROCKWELL MANUFACTURING COMPANY

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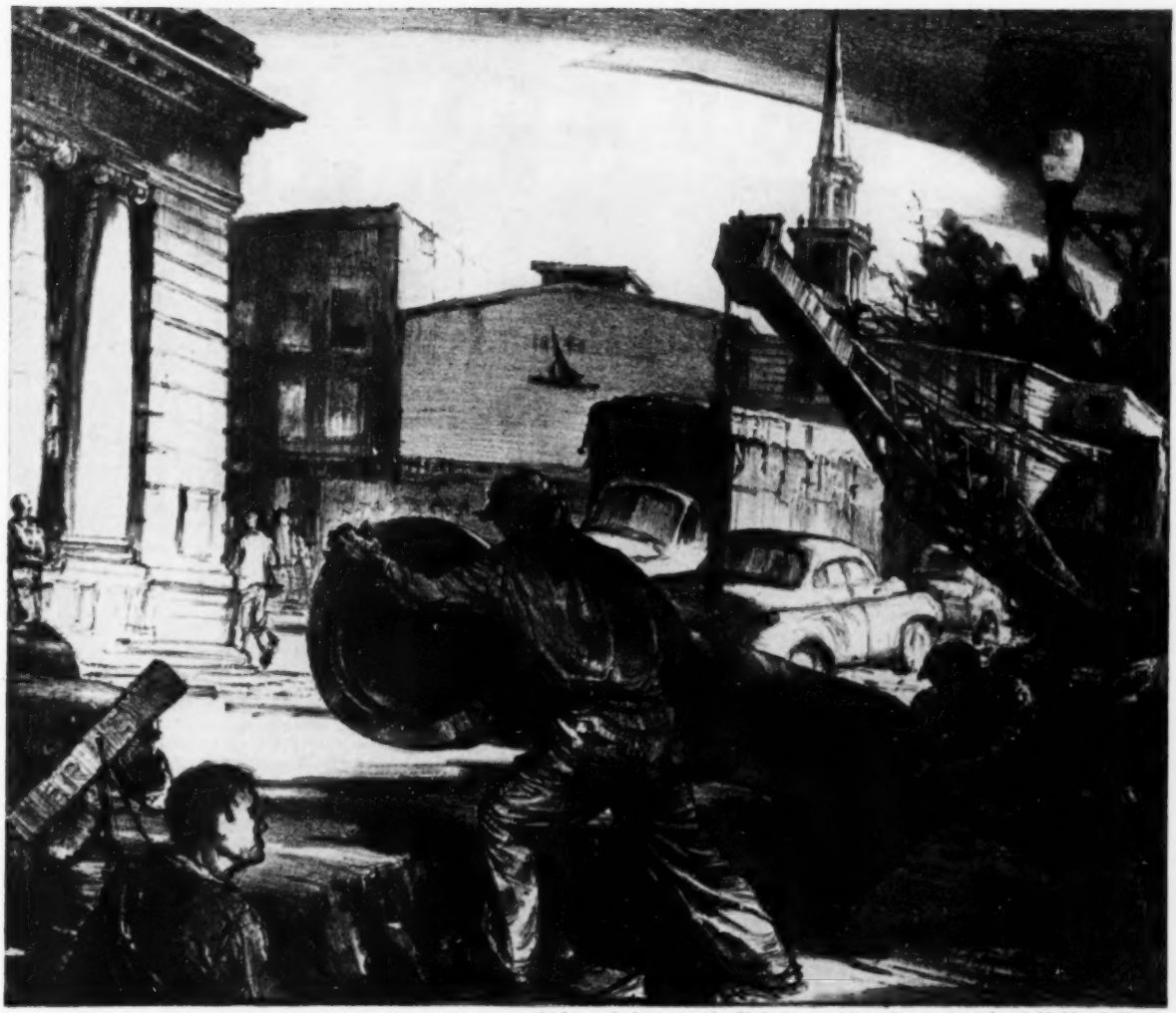
The Symbol for Service, Quality and Performance in Water Meters



Lithographed on stone for U. S. Pipe and Foundry Co. by John A. Noble, A. N. A.

THIS ILLUSTRATION shows the laying of cast iron pipe in the business section of a small town, which could be for water, gas or sewerage service. Such a situation calls for a pipe with proved long life to be placed beneath the costly permanent pavement. Whether in the business district, residential area or the country, cast iron pipe has established an enviable record of low cost per service year.

We are in an excellent position to furnish your requirements for cast iron pipe, either centrifugally cast in sizes 2- to 24-inch or pit cast for larger sizes—all of which are produced under rigid quality controls and in accordance with standard specifications.

United States Pipe and Foundry Co.,
General Office, 3300 First Ave., N. • Birmingham 2, Ala.
Plants and Sales Offices Throughout the U. S. A.

U.S.
cast iron
PIPE
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

☞ **Our General Office is now located in Birmingham, Ala., instead of Burlington, N. J.**

ANNOUNCING...

P.F.T.
Pearth Gas Recirculation
AS AN ADDED FEATURE OF
CONTROLLED DIGESTION

Photo showing assembly of explosion proof compressor and controls in housing mounted on P. F. T. Floating Cover for P. F. T. -Pearth Gas Recirculation

Coal Creek Plant
Tulsa, Oklahoma
Water & Sewer Department
City of Tulsa
Engineers

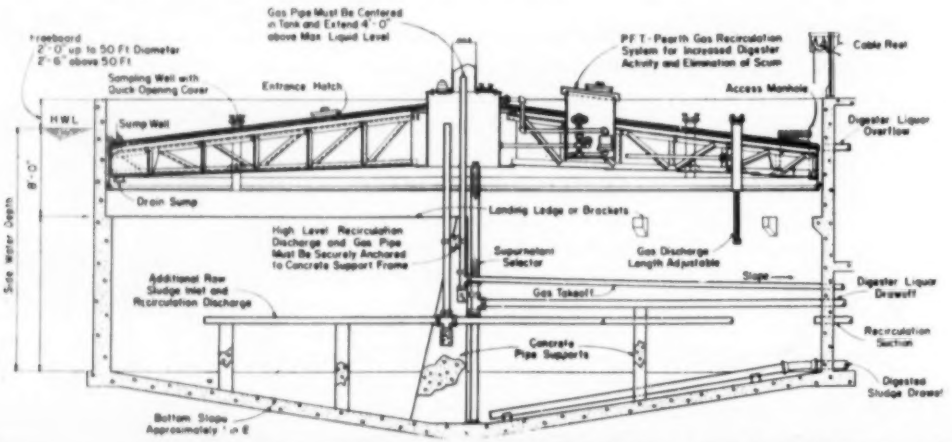
RATE of digestion is stepped up and scum accumulations are eliminated by means of this simple and effective system of recirculating gas in sludge digestion tanks. The system is available as an integral part of, or an attachment to the standard P. F. T. Floating Cover, and is also available for use with fixed concrete covered tanks.

The P. F. T. -Pearth Gas Recirculating system as now commercially available was originally developed and patented by the operating staff of the Washington, D. C. Sewage Treatment Plant in an attempt to overcome a difficult scum problem due to an overloaded condition of the digesters. Its merits were demonstrated for more than a year in the full scale operation involving eight of the 84 ft. diameter digesters at that plant.

The system as applied to P. F. T. Floating Covers is now in operation at the Coal Creek plant of the City of Tulsa and will soon be in operation at a number of other sewage treatment plants.

GENERAL DETAILS

The recirculation of a relatively small amount of digester gas from the gas collecting dome of a floating cover, to points below the scum level, causes digester liquor to be displaced into the scum zone by the gas lifting action, and agitates the scum while traveling towards the gas collecting dome, causing entrained gas in the scum to be released. With this system there are no moving parts in the digestion tank contents and the problems of clogging, experienced with other devices, are eliminated. Further information may be obtained from P. F. T. Bulletin 332.


Gas Pipe Must Be Centered in Tank and Extend 4'-0" above Max. Liquid Level
Freeboard 2'-0" up to 50 Ft Diameter 2'-6" above 50 Ft
Sampling Well with Quick Opening Cover
Entrance Hatch
PF T - Pearth Gas Recirculation System for Increased Digester Activity and Elimination of Scum
Cable Rack
Access Manhole
H.W.L.
Sump Wall
Digester Liquor Overflow
8'-0"
Side water Depth
Drain Sump
Landing Ledge or Brackets
High Level Recirculation Discharge and Gas Pipe Must Be Securely Anchored to Concrete Support Frame
Supernatant Selector
Gas Discharge Length Adjustable
Slope
Additional Raw Sludge Inlet and Recirculation Discharge
Gas Takeoff
Digester Liquor Drawoff
Recirculation Suction
Concrete Pipe Supports
Digested Sludge Drawoff
Bottom Slope Approximately 1 in 6

PACIFIC FLUSH TANK CO.

P.F.T.

Waste Treatment Equipment Exclusively Since 1893

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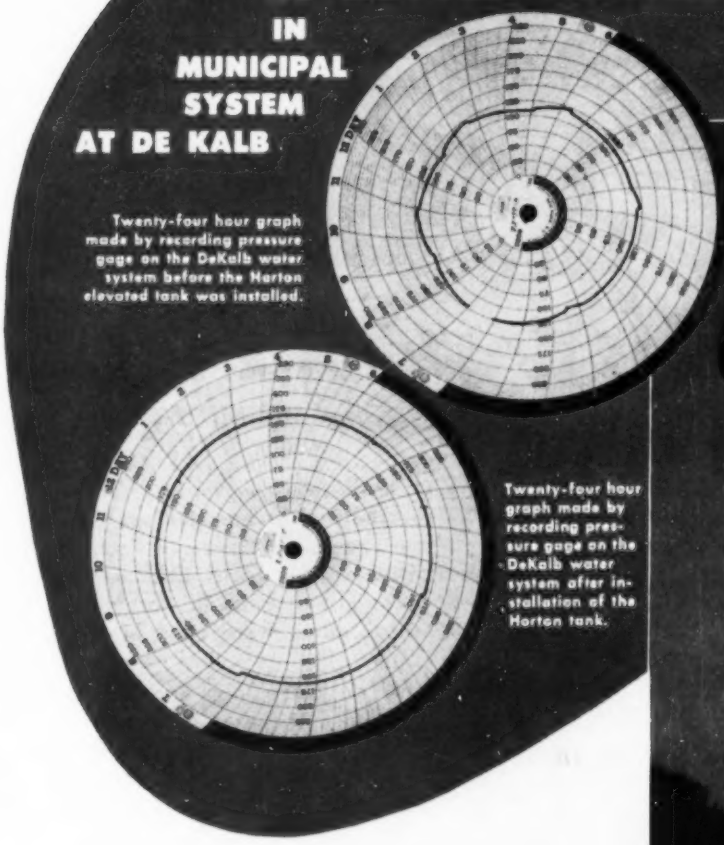
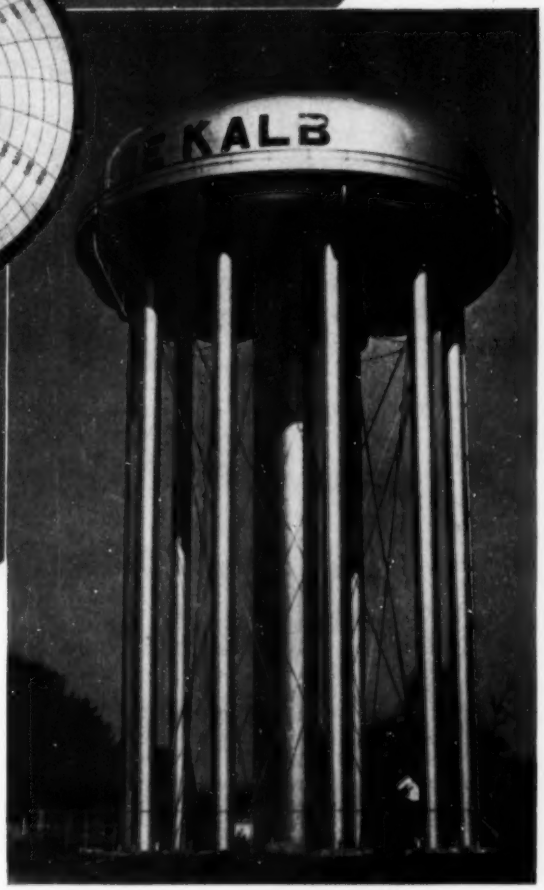
NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

GRAPHIC STORY OF BETTER WATER SERVICE IN MUNICIPAL SYSTEM AT DE KALB



Twenty-four hour graph made by recording pressure gage on the DeKalb water system before the Horton elevated tank was installed.

Twenty-four hour graph made by recording pressure gage on the DeKalb water system after installation of the Horton tank.



CB&I Field Welding Supervisor helped build a better tank

A glance at the pressure charts reproduced above tells the story of what happened after a 750,000-gal. Horton elevated tank was installed in the municipal water system at DeKalb, Illinois. Pressures were raised —variations were reduced and there is more water on hand at all times for emergencies.

In addition to these usual benefits, there is another reason why you should consider a Horton tank for your water system. Whenever a Horton tank is erected, we assign a Field Welding Supervisor to follow its construction. His job is to check welding equipment and to make sure that every welder is qualified for the job. He assists with the cutting and grading of test plugs and runs any other tests called for in the governing specifications . . . *all at no extra cost to you!*

Horton elevated tanks are built in standard capacities from 5,000 to 3,000,000 gallons. Write our nearest office for estimates or quotations.

HORTON

WELDED STEEL STORAGE TANKS

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3	2181 Healey Bldg.	Los Angeles 17	1555 General Petroleum Bldg.
Birmingham 1	1586 North Fiftieth St.	New York 6	3390—165 Broadway Bldg.
Boston 10	1048-201 Devonshire St.	Philadelphia 3	1644—1700 Walnut Street Bldg.
Chicago 4	2198 McCormick Bldg.	Pittsburgh 19	3260 Alcoa Bldg.
Cleveland 15	2262 Midland Bldg.	San Francisco 4	1583—200 Bush St.
Detroit 26	1551 Lafayette Bldg	Seattle 1	1350 Henry Bldg.
Houston 2	2115 C. & I. Life Bldg.	Tulsa 3	1646 Hunt Bldg.

WHAT PRICE *Valve Failures?*

DOUBLE DISK VALVE

TAPPING SLEEVE AND VALVE

AIR VALVE

CHECK VALVE

FIRE HYDRANT

In Long Beach, California reservoir storage consists of a number of steel tanks 132 feet in diameter and 35 feet high, interconnected with Rensselaer valves. In Rochester, New York, many Rensselaer valves, 16 to 42 inch, were recently installed in water main extensions. In Port Washington, Wisconsin Rensselaer valves were used in their new filtration plant.

The water superintendents on these jobs knew that failure could be catastrophic and that the cost of maintenance alone could offset the fundamental efficiency of the entire system.

Be Right THE FIRST TIME *with Rensselaer*

Rensselaer gate valves were chosen for these jobs primarily because of previous experience and the fact that Rensselaer has meant "better than AWWA specifications" from the beginning.

All Rensselaer products have extra service characteristics. The wedge design on double disc valves, the adjustable spring on check valves, and a dozen other exclusive features of Rensselaer pay extra dividends in dollars and security for more than a lifetime.

Ask for the complete series of bulletins on the products mentioned or let our nearest representative help with your problems.

Rensselaer VALVE COMPANY, TROY, N. Y.

GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES • CHECK VALVES • AIR RELEASE VALVES

A SUBSIDIARY OF NEPTUNE METER COMPANY

Sales representatives in principal cities

This "whirling tube" is inside the amazing Fairbanks-Morse *Bladeless* Impeller Pump . . . just a "whoosh" and fibrous material goes right through.

Fairbanks-Morse engineers designed this impeller without blades or projections that catch and hold trash—it's truly non-clog. Even a man's complete coveralls went through a 4-inch pump without clogging!

See your Fairbanks-Morse Distributor or Local Branch Office about this *Bladeless Impeller* Pump . . . or write Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY
RAIL CARS • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

CONCRETE PIPE

is your best buy for sewers

Leading sanitary engineers specify concrete pipe for sewers because it offers:

UNUSUAL DURABILITY that enables it to give long years of heavy-duty service.

MAXIMUM CAPACITY because of its smooth interior finish and clean, even joints.

MINIMUM INFILTRATION AND LEAKAGE due to its uniformly dense structure and its tightly sealed joints.

GREAT STRENGTH to sustain heavy overburdens, resist severe impact, withstand severe climatic and soil conditions.

LOW-ANNUAL-COST ECONOMY that is the result of moderate first cost, low maintenance expense and extra long life.

AMERICAN CONCRETE PIPE ASSOCIATION

228 N. La Salle St., Chicago 1, Ill.

CLEVELAND, OHIO

Nottingham Plant

(Completed in 1951)

HAVENS & EMERSON
Consulting Engineers

Cleveland, Ohio — New York, N. Y.

This important filtration plant and its pumping facilities represents one of the major municipal projects completed since World War II. No effort was spared in the design and construction of this 100 MGD plant to provide the utmost in accuracy and dependability of operation. A visit to the Nottingham Filtration Plant is a liberal education in modern water works design — from the semi-circular control panel in the Pump Building to its ultra-precise chemical feeding equipment in the Chemical Building. The plant is under the direction of John A. Marsh, Sup't.

Chemicals used in the treatment process are received in carload shipments, and are pneumatically unloaded into storage bins. High-accuracy Omega Chemical Feeders and Lime Slakers — installed by Pitt Construction Co. of Pittsburgh — deliver the proper chemical dosages as determined by analyses made in the laboratory in the Administration Building. For information on Omega Water Works Equipment, address Omega Machine Co. (Division of B-I-F Industries), Providence 1, Rhode Island.

B-I-F Industries Equipment furnished for the Nottingham Plant:

OMEGA

2 — Loss-in-Weight Gravimetric Feeders (7.5 to 750 lb. per hr.) for activated carbon.

2 — Loss-in-Weight Gravimetric Lime Feeders and Slakers (20 to 2,000 lb. per hr.).

3 — Loss-in-Weight Gravimetric Feeders (20 to 2,000 lb. per hr.) for alum.

BUILDERS

Pneumatically-operated Meters, Controllers, and Gauges for raw water, filter effluent, wash water, and distribution. Pneumatic Filter Rate Setting and Master Control System.

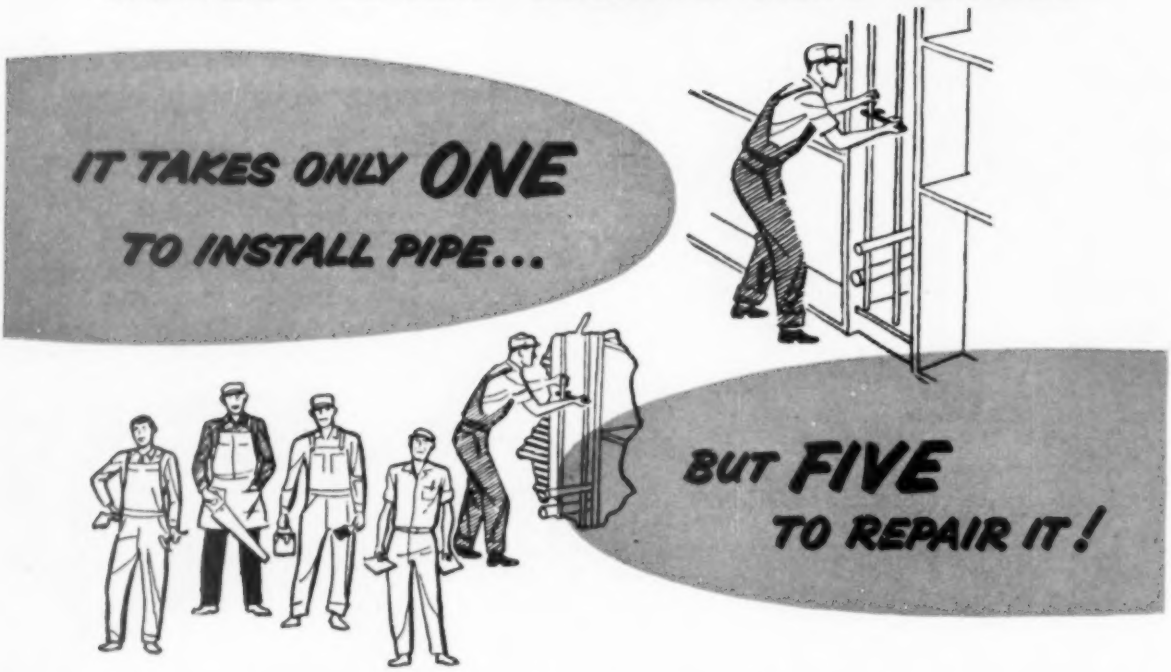
B-I-F INDUSTRIES

OMEGA

THE LAST WORD IN FEEDERS

OMEGA

Here's why CORROSION COSTS YOU MORE than WROUGHT IRON



One of the most convincing demonstrations of the economy of using *durable* material is a pipe repair job where low-first-cost material has failed—and is being replaced.

The original installation had been quickly made by plumbers. But the replacement calls for hours of work by as many as five crafts: plumber, mason, plasterer, carpenter, painter. Often, maintenance is billed at overtime rates. And this is only part of the cost story. Production slow-down, disrupted routine may amount to far more than the maintenance charges.

Fortunately there's an answer to pipe durability in corrosive services—Byers Wrought Iron pipe. In literally thousands of applications where corrosion is a threat, the use of this material has proved the soundest kind of economy move.

The next time you specify or approve pipe, you'll find it profitable to investigate the durability records of wrought iron.

Our bulletin, "The ABC's of Wrought Iron," gives the what, why and where of this material. Write for a copy.

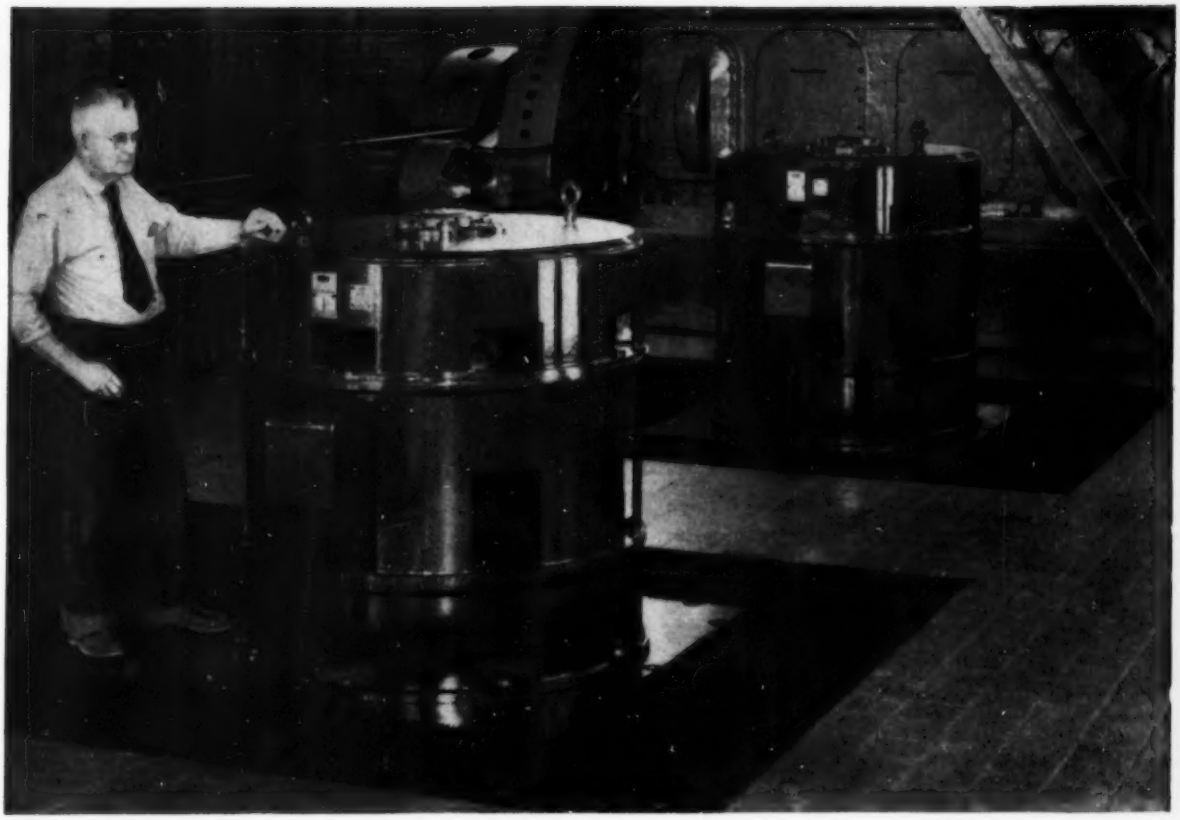
A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, New York.

Remember—
the pipe that lasts
the longest
costs the least!

FOR PRODUCTION CONTINUITY
LOWER MAINTENANCE—
Insist on Byers
WROUGHT IRON PIPE

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON
WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS



10 AND 11 FOR FLINT

Twenty-five years ago, the city of Flint, Michigan, purchased the original motors for its Third Avenue Sewage Pumping Station from E-M.

In 1948, the city bought six additional motors from E-M, totaling over 2,500 hp.

This year, Flint installed two more E-M motors — the 400 hp, 585 rpm vertical induction motors shown above to drive sewage pumps.

These repeat orders for eleven motors, based on years of experience with the product, are the most convincing proof we know of the reliability and economical operation of E-M motors. A customer has to be thoroughly pleased to place his *third* order!

Flint's new E-M motors offer premium efficiencies and reliability for tough, round-the-clock drives. They're protected against moisture and corrosive fumes by special insulation. And their simple, rugged construction is easy to adapt to vertical drives.

When you need power for the biggest, toughest pumping jobs, you can rely on E-M induction and synchronous motors . . . because they're specially designed for your particular needs, by E-M specialists in big motor engineering.

Call your nearest E-M field engineer for his suggestions on your specific requirements, and write to the factory for Pump Bulletin No. 33.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

1300-TPA-2126

SPECIALISTS IN *Big Motor* ENGINEERING

6 Good Reasons for using this Superior Steel Pipe

When you consider a new sewage line, you want tested steel pipe that is strong, resilient, economical to handle and install, and above all, leakproof. Bethlehem Tar-Enameled Steel Pipe meets these qualifications. Here are six good reasons why you'll find it the ideal pipe for all types of sewage:

1. BEAM STRENGTH

Bethlehem Tar-Enameled Steel Pipe is made from high-quality steel plate. It's a husky pipe, with great beam strength. It can be handled in multiple lengths, and is unaffected by washouts.

2. CORROSION-RESISTANCE

Bethlehem Pipe is lined and coated with a smooth layer of coal-tar enamel, meeting AWWA Specifications. The enamel is impervious to corrosion and incrustation and ensures high flow-coefficients.

3. SHOCK-RESISTANCE

Bethlehem Steel Pipe is designed with a safety factor of about 4 against bursting. It is resistant to water-hammer, and can carry a load of nearly four times the working pressure.

4. LEAKPROOF JOINTS

Bethlehem Pipe makes a tight line, with joints made by mechanical couplings, welding or riveting. It safely spans washouts caused by floods, or by leaky joints in lines made of other materials.

5. RESILIENCE

Bethlehem Steel Pipe has the resilience to "give" under soil movement. It is immune to surface vibrations caused by heavy vehicular traffic, making possible years of dependable service.

6. LONG LENGTHS

Bethlehem Steel Pipe generally comes in 40-ft lengths. This reduces the laying cost, as only 132 joints are required per mile. It is made in any diameter from 22 in. i.d., and in any wall thickness.

A Bethlehem representative will be pleased to supply additional information about tar-enameled pipe. All you need do is contact the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM *Tar-Enameled* STEEL PIPE

No Need to Compromise on Water Quality

GIVE the best. And the simple, foolproof way to safeguard tap water against taste and odor pollution is the use of Aqua Nuchar Activated Carbon.

Let one of our Threshold Odor Experts show you how. Without obligation, he will make a thorough threshold odor survey of your plant. These surveys frequently point the way to reduction of over-all chemical costs as well as providing for complete taste and odor control through better utilization of Aqua Nuchar.

INSURES PALATABLE NUCHAR DRINKING WATER

industrial CHEMICAL SALES
division west virginia pulp and paper company

NEW YORK CENTRAL BLDG.
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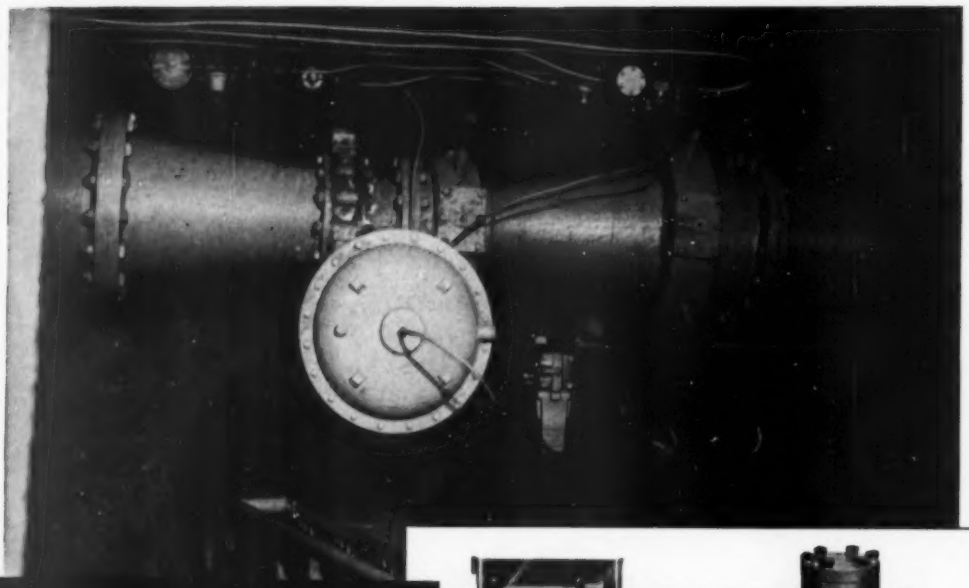
NEW YORK 17, N. Y.

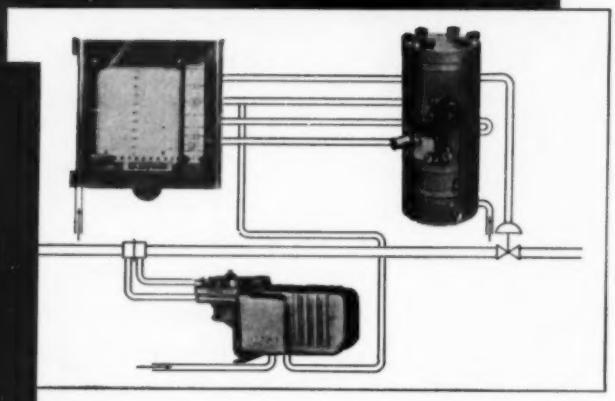
LINCOLN-LIBERTY BUILDING
BROAD AND CHESTNUT STREETS
PHILADELPHIA 7, PA.

2779 MORELAND BLVD.
AT SHAKER SQUARE
CLEVELAND 20, OHIO

PURE OIL BLDG.
35 E. WACKER DRIVE
CHICAGO 1, ILL.



engineered instrumentation *helps fight stream pollution*



COMPACT CONTROL SYSTEM, *using Tel-O-Set Controller and Differential Converter, fits readily in the sump of an industrial waste-treatment plant . . . controls flow right on the spot. Inset shows simple basic elements of typical Tel-O-Set flow control system.*

By utilizing the *Tel-O-Set* family of miniature indicators, recorders and controllers, your waste treatment processes can reap the benefits of precise, dependable control . . . through instrumentation so compact that it goes wherever you need it.

They're versatile: supplied for measuring and controlling flow, temperature, pressure and liquid level . . . with a broad selection of primary elements and remote pneumatic transmitting devices.

They're accurate: transmitter and controller can be readily located at the point of measurement to eliminate time lags.

They're compact: *Tel-O-Set* indicators and recorders fit readily into graphic panels . . . need only 5" by 5" panel area. Differential Converter and *Tel-O-Set* Controller need extremely little elbow room . . . fit easily into cramped quarters in sumps and wells.

They're economical: initial cost is reasonable, and maintenance requirements are practically negligible.

Water and sewage plant superintendents in increasing numbers are finding that *Tel-O-Set* instruments measure up to the highest standards of dependability and performance. Your local Honeywell engineering representative will be glad to discuss your own plant's control needs with you and your consulting engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4575 Wayne Ave., Phila. 44, Pa.

● **REFERENCE DATA: Write for Data Sheets and Bulletins on *Tel-O-Set* instruments.**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

MUELLER

Mechanical Joint Tapping Sleeves and Valves

Eliminate Calking!

No pouring of lead or calking of any kind is necessary with Mueller Mechanical Joint Tapping Sleeves and Valves. A permanent leak-proof joint can be quickly and easily made even under adverse weather conditions.

All end and side gaskets are totally confined to eliminate cold flow. With only two sets of gaskets, one sleeve for a nominal size of pipe will fit all classes of cast iron pipe regularly used.

Sleeves are available for immediate delivery to fit 4", 6", 8", 10" and 12" main with outlets equal size or smaller.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

SPECIFY RODNEY HUNT

FOR SLUICE GATES

Standard Sizes: 6" to 108" diameter
Larger Rectangular Sizes for Special Installations

Illustrated are three 72" x 96" bronze-mounted sluice gates; part of a 300,000-pound shipment to the U.S. Corps of Engineers for high-head use. This is only one of 2000 sluice gate combinations that can be ordered directly from the Rodney Hunt catalog!

With new equipment and enlarged facilities we can bid competitively with firm delivery on a wide range of gates. Modern foundry practice and precision finishing make Rodney Hunt sluice gates an important, low-maintenance asset to any water control project.

Free! 232-page color catalog

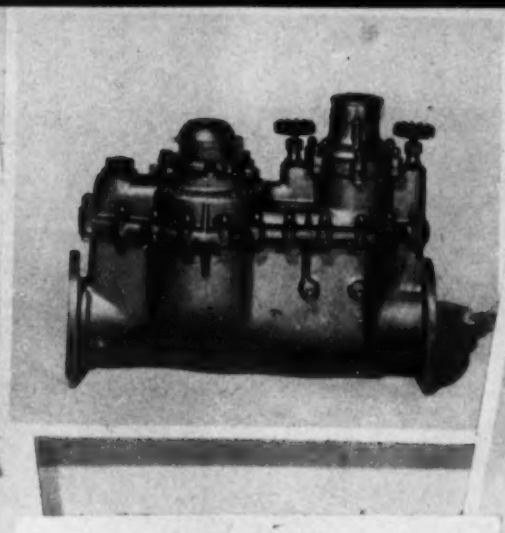
This is one of the most complete works in the field. It contains photographs, drawings, specifications and complete descriptions of our sluice gates, timber gates, hoists, valves, racks and rakes, plus a valuable 28-page section of engineering data on hydraulic problems.

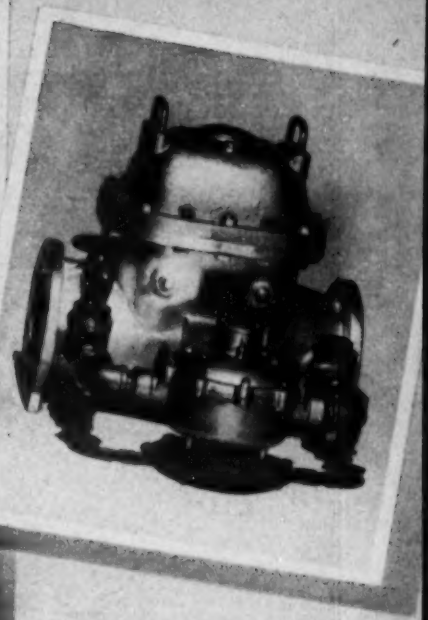
This important catalog was specially prepared and edited for consulting engineers, contractors and other executives who are *actively* engaged in the water control field. Please write on your letterhead for Catalog WCA-952. Rodney Hunt Machine Co., 84 Lake St., Orange, Mass., U.S.A.

RODNEY HUNT

Water Control Apparatus Division

Manufacturing Engineers Since 1840



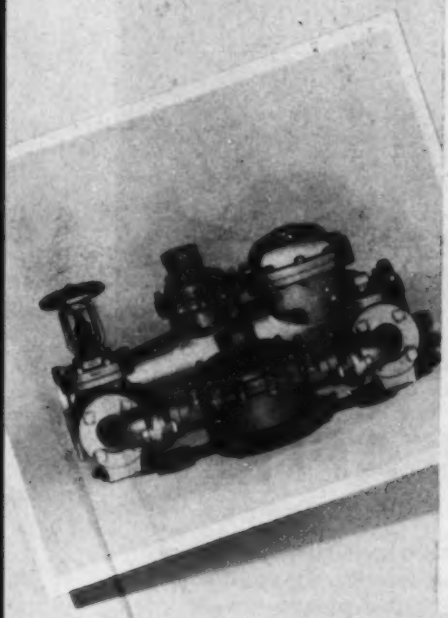


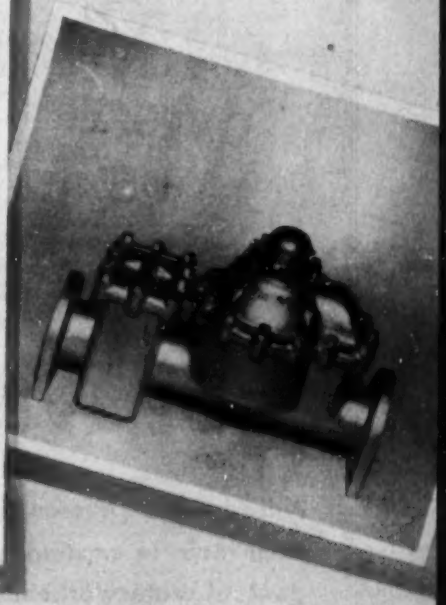
For over 67 years, **HERSEY** has been building water meters to meet the constantly expanding demand for all types of water measurements, both domestic and industrial. Hersey engineers of long experience are continually designing and improving water meters to fill these needs, and you will find fully described in the Hersey catalog a meter to fit your every need, be it for the measurement of a trickle or a torrent. For accuracy, low maintenance cost and durability, Hersey Water Meters will give you the greatest satisfaction.

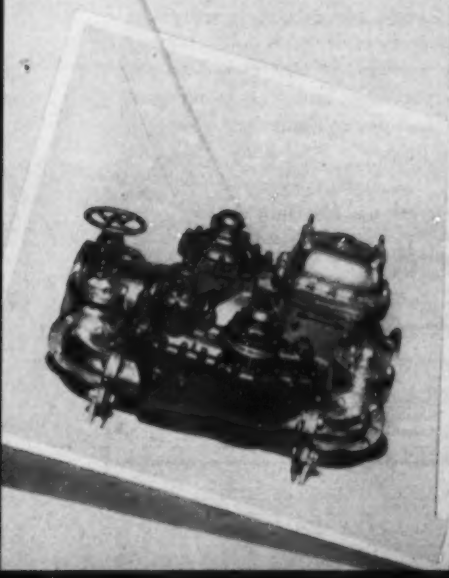
HERSEY MANUFACTURING COMPANY

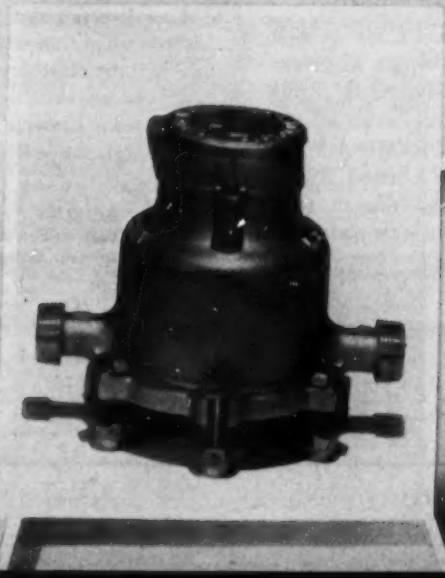
SOUTH BOSTON, MASS.

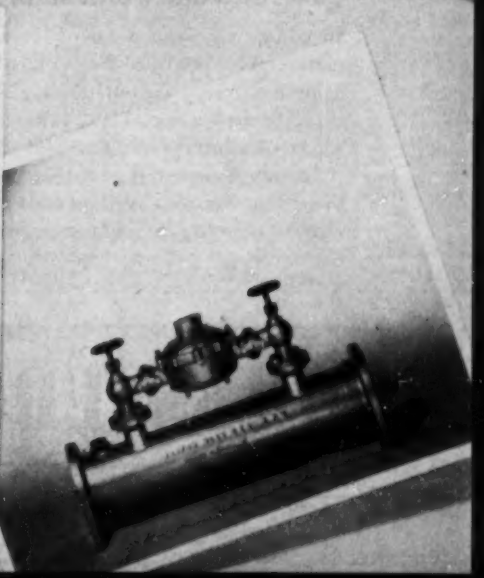
BRANCH OFFICES: NEW YORK — PORTLAND, ORE.
PHILADELPHIA — ATLANTA — DALLAS — CHICAGO
SAN FRANCISCO — LOS ANGELES











DELIVERS WATER CHEAPER

Philadelphia Dresser-Couples 2-mile steel main in expanding program of general waterworks improvement.

In adding to many miles of Dresser-Coupled steel mains laid since the War, Philadelphia engineers again recognized the outstanding advantages of this type of construction. These twin steel lines meet the needs of central and southern Philadelphia.

Dresser-Coupled steel mains are a sound investment. The beam strength of steel pipe, plus the non-rigidity of both pipe and couplings, assures a husky, flexible, permanently tight line. Glass-smooth linings sustain high carrying capacity. Dresser-Coupled installations fit in well with existing structures . . . are readily adaptable for future changes.

Actual installation is fast and relatively simple. Lighter weight steel pipe is easier to handle. Long pipe lengths mean fewer joints. Small crews, with a minimum of skill, supervision and heavy equipment, make joints faster, surer. The result—lower cost, maintenance-free lines.

BE SURE **you get the *best* line at the *best* price. Always put steel pipe and Dresser Couplings in *your* specifications.**

DRESSER® COUPLINGS

Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, California. Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco. In Canada: Toronto, Ont.

OVER 2000 REX CONVEYOR SLUDGE COLLECTORS IN OVER 700 CITIES AND INDUSTRIES!

WHAT BETTER PROOF of Rex superiority?

YES over 700 cities and industries rely on Rex® Conveyor Sludge Collectors for efficient, dependable and economical operation. These precision engineered sludge collectors are applicable for all types of sludge handling or surface skimming conditions in either sewage, water or industrial waste treatment application . . . no application is too large or too small . . . and each receives the full benefit of Rex Engineering.

Here are some of the outstanding time-proven features of Rex Sludge Collectors that make them leaders in their field:

★ ***Balanced Equipment Design***—design proportionate throughout.

★ ***Rex Z-Metal Chain*** and attachments—corrosion and wear resistant.

★ ***Self-Aligning Bearings***—easy to install. Compensate for tank irregularities . . . prevent accumulation of settled solids.

★ ***Offset Split Drive Sprockets***—eliminate bulky cantilevered brackets. Easy to replace.

★ ***Centralized, Hardened Wearing Shoes***—eliminate splitting strains on wooden scraper flights. Means longer life, lower maintenance.

★ ***Double Life Sprockets***—chain engages only every other sprocket tooth.

★ ***Drive Unit***—compact, totally enclosed. Shear pin protection. Jaw clutches provided where independent operation is required.

★ ***Sub-Assemblies***—shop assembly of drive units and shaft assemblies assure proper alignment and fit.

MAKE SURE YOU WILL BE THE NEXT ONE to profit from Rex design and Rex quality. Get all the facts on Rex Conveyor Sludge Collectors. Call your nearest Rex Sanitation Engineer or write for Bulletin 47-9. Chain Belt Company, 4610 W. Greenfield Ave., Milwaukee 1, Wisconsin.

REX®

Chain Belt COMPANY OF MILWAUKEE

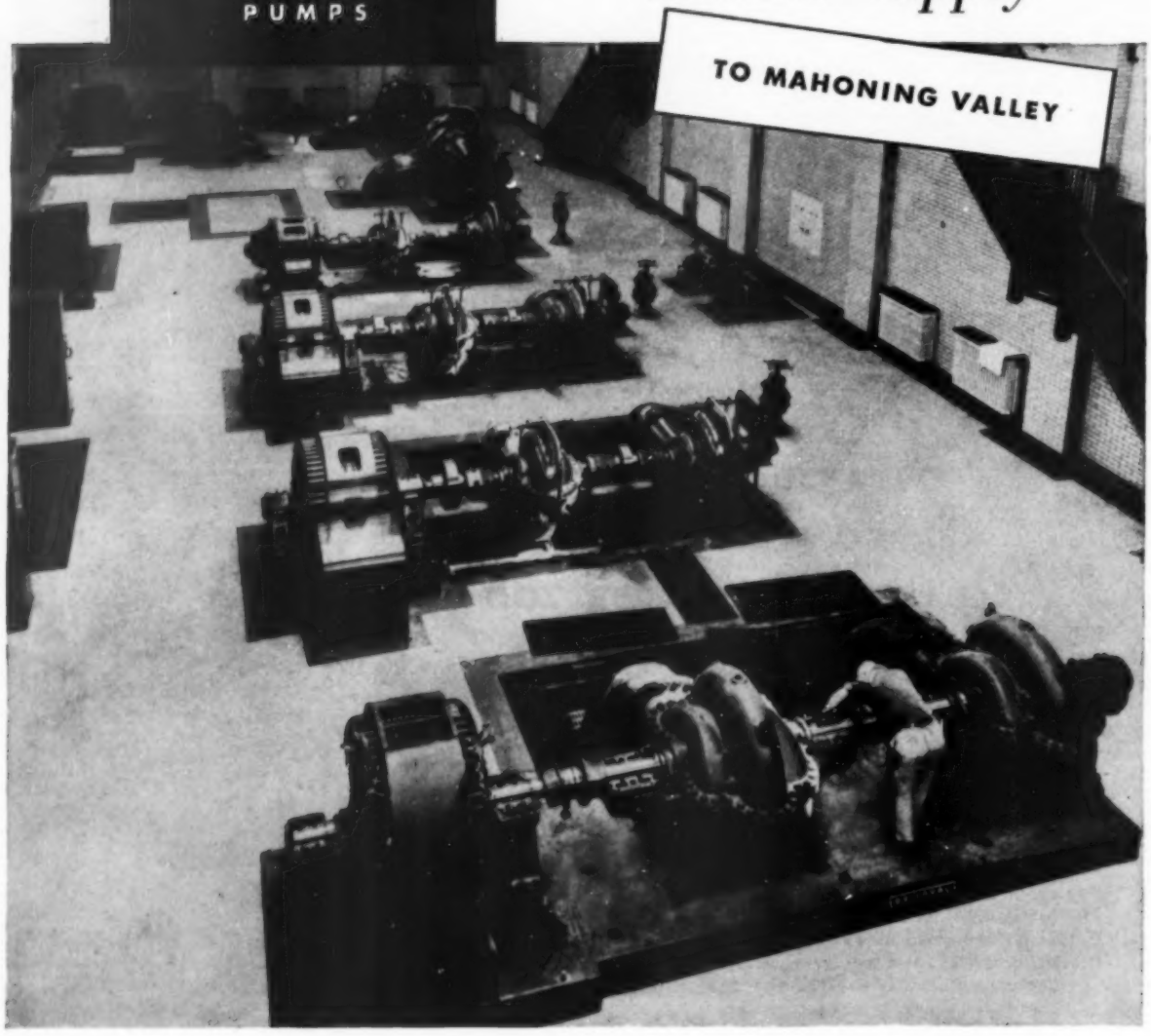
Atlanta • Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Dallas Denver • Detroit • El Paso • Houston • Indianapolis • Jacksonville • Kansas City • Los Angeles Louisville • Midland, Texas • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh Portland, Ore. • W. Springfield, Mass. • St. Louis • Salt Lake City • San Francisco • Seattle • Tulsa • Worcester

Distributors in Principal Cities in the United States and abroad.

Export offices: 4800 W. Mitchell Street, Milwaukee, Wisconsin; and 19 Rector St., New York City

DE LAVAL
CENTRIFUGAL PUMPS

bring a new high in water supply



With the addition of a new De Laval 20 mgd centrifugal pump at the Mahoning Valley Sanitary District in Ohio, the station now has a pumping capacity of 60 mgd plus stand-by. This pumping capacity provides for the future program requirements of the water treatment plant.

Vitally important is the fact that the additional facilities were installed without major building alterations or interruptions of service.

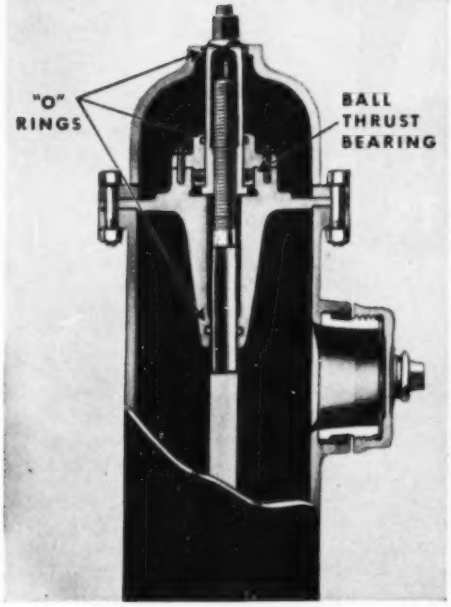
The story of De Laval Centrifugal Pumps is one of nation-wide significance, for De Laval units have been serving the districts, large cities and small towns of America for more than half a century. Efficient De Laval Centrifugal Pumps for water works service are available in capacities from 100 thousand gallons per day to more than 100 million gallons per day.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
Nottingham Way, Trenton 2, New Jersey

DL197

TRADE
DARLING
MARK



A. W. Grathwol, manager of the Sandusky, Ohio, Water Distribution Department, checking static water pressure on a newly installed Darling B-50-B hydrant.

Word is getting around about DARLING'S NEW B-50-B FIRE HYDRANT

WATER distribution men like A. W. Grathwol of the Sandusky, Ohio, Water Distribution Department, are spreading the good news about the new patented Darling B-50-B fire hydrant. It rates as the most important fire hydrant advance in 50 years.

Here are reasons why . . .

1. The "O" ring seals eliminate need for a stuffing box. Darling's B-50-B is a packless, *dry-top* hydrant that saves service time and trouble. It does away with bothersome packing gland adjustment and maintenance, assures constant lubrication of the operating threads *and prevents water from reaching the operating threads.*

2. The Darling B-50-B is a *ball-bearing* operated hydrant. Opening and closing takes less than half the usual wrench torque.

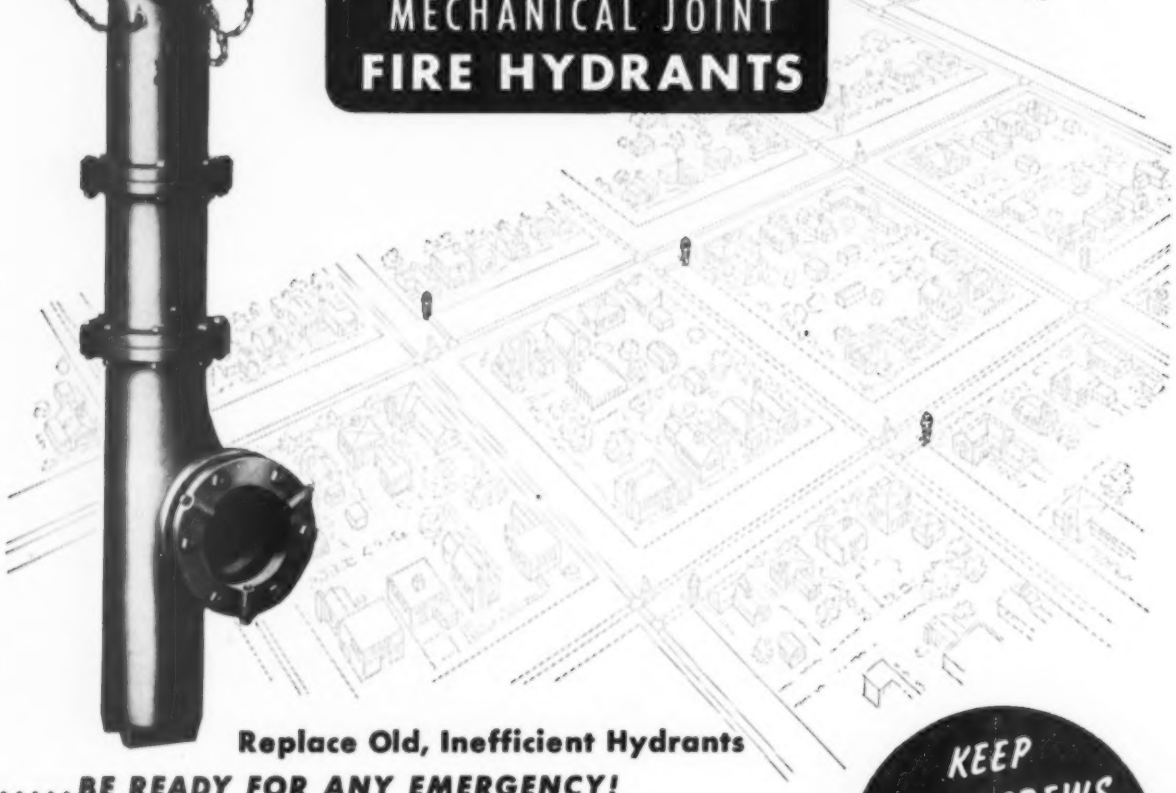
And you also get another long-time advantage of Darling hydrants . . . all inside working parts, including the main valve seat and drain valve seats, can be removed through the top *by one man* for on-the-spot inspection and maintenance. Write for Bulletin No. 5007 before you decide on any hydrant. Address . . .

DARLING VALVE & MANUFACTURING CO.
Williamsport 22, Pa.
Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ontario

ACT NOW!

revitalize your fire protection system... quickly and easily, with

IOWA
MECHANICAL JOINT FIRE HYDRANTS



Replace Old, Inefficient Hydrants

.....BE READY FOR ANY EMERGENCY!

Don't wait for disastrous fires to strike—regrets can't compensate for loss of life or property. Retire those worn-out and obsolete hydrants, eliminating costly repair jobs. Just dig up the old hydrant, melt out the lead joint, and install a new Iowa Mechanical Joint Fire Hydrant which is supplied with all necessary joint accessories... no lead, no jute or calking. These mechanical joints fit all kinds of cast iron pipe—a ratchet wrench is all that's needed to complete a "bottle-tight" joint. Fast, simple and economical.

Act now, before it's too late!

Write today for further details.

KEEP WORK CREWS BUSY ON JOBS LIKE THIS... IT PAYS!

IOWA VALVE COMPANY

201-299 N. Talman Ave., Chicago 80, Ill. • *A Subsidiary of James B. Clow & Sons*

IN THE CHICAGO AREA

only C-P-P* meets the BIG 3 REQUIREMENTS

The Chicago area's first Prestressed Concrete water supply line was installed in 1939. They've watched its performance carefully ever since.

That's why Price Prestressed Pipe was picked for two recent lines in the Chicago area . . . one 2,700 ft. line of 30" pipe and one 37,000 ft. line of 24". They wanted *long life, sustained high carrying capacity and great structural strength*—the "Big 3" requirements of water lines . . . and only concrete could do the job.

1. *Long life.* With Price Prestressed Pipe, only *concrete* is exposed. When buried in the ground, concrete is ageless as limestone . . . life is measured in centuries.

2. *Sustained capacity.* Properly placed concrete has the highest flow coefficient of any pressure pipe structural material . . . will never corrode or tuberculate under ordinary conditions. And the concrete core is there "for good," because it is a structural part of the pipe.

3. *High beam strength.* Price Prestressed Pipe makes your water line safe from external loads. It is shatterproof . . . and sudden and complete failure is all but impossible.

They picked Price Pipe for other reasons, too. It's easy to lay, easy to tap and watertight. It has great economy because of low original cost, low maintenance and extra-long trouble-free life.

Get Prestressed Concrete Pipe in *your* specifications. It will give your installations the same "Longest trouble-free service at lower cost" that Chicago enjoys. Ideal for sewer lines, too. Just mail the coupon for more information.

* only CONCRETE PRESSURE PIPE meets the BIG 3

- LONG LIFE
- SUSTAINED CAPACITY
- GREAT STRENGTH

PRICE Pressure PIPE

PRESTRESSED CONCRETE

STEEL-CYLINDER PIPE

Price Brothers Company

1817 East Monument Avenue
Dayton 1, Ohio

Please send me, without obligation, the following literature:

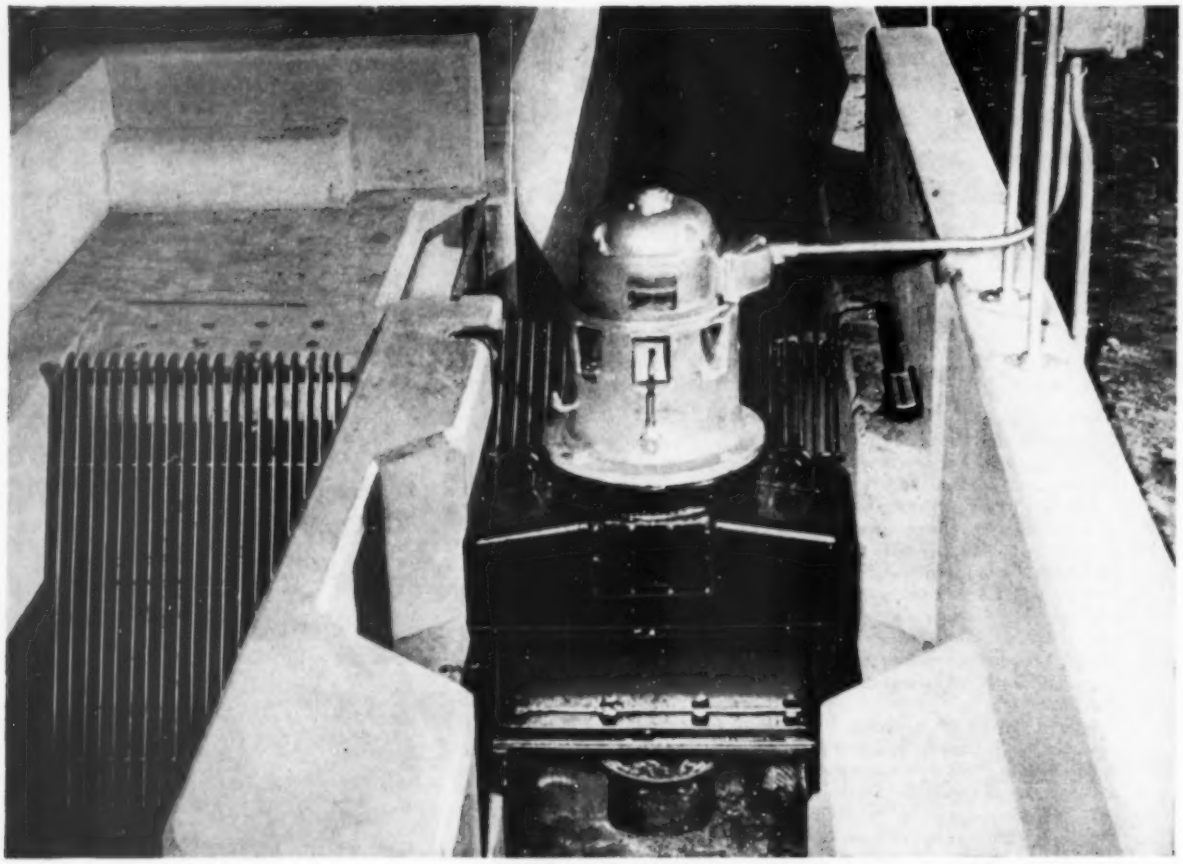
- ☐ Check Sheet of Water Line Requirements
- ☐ Facts on Prestressed Pipe
- ☐ Price Pipe for Pressure Sewer Lines

Name_____

Title_____

Organization_____

Address_____



COMMINUTORS ARE READILY INSTALLED in new or existing rectangular straight-through flow sewage channels. They may be used either as single units shown above or multiple units, depending on your needs.

Worthington comminutors eliminate costly handling of sewage solids

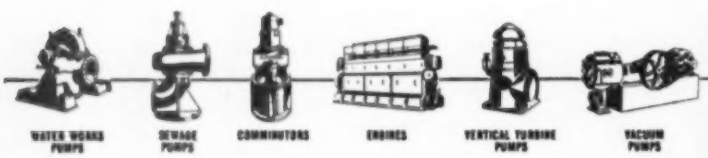
With a Worthington comminutor operating continuously, you can forget about raking, hauling, grinding, and burial or incineration of coarse solids. Here's why:

Worthington comminutors *automatically* cut coarse solids in raw sewage so rapidly that loss of head is minimized. Peak loads in excess of comminutor capacity are easily handled by a baffle screen. The addition of a mercury seal keeps all working parts watertight for continuous operation even when comminutor itself is submerged.

Quick, simple installation in either new or existing rectangular sewage channels, indoors or outside, keeps costs to a minimum. Stainless steel screens and cutters are easy to remove for inspection, adjustment, sharpening or replacement.

Worthington engineers will be glad to help you mechanize and modernize this or any other phase of your sewage treatment. Write for full details on Worthington's complete line of sewage disposal equipment. Worthington Corporation, Public Works Division, Section W.3.3, Harrison, N. J.

W.3.3



All Major Public Works Equipment Under One Responsibility

WORTHINGTON

Public Works Equipment

Central Tank—300,000 gallon Double-Ellipsoidal design. Tower height 48 ft 4 ins.

BALANCED WATER STORAGE

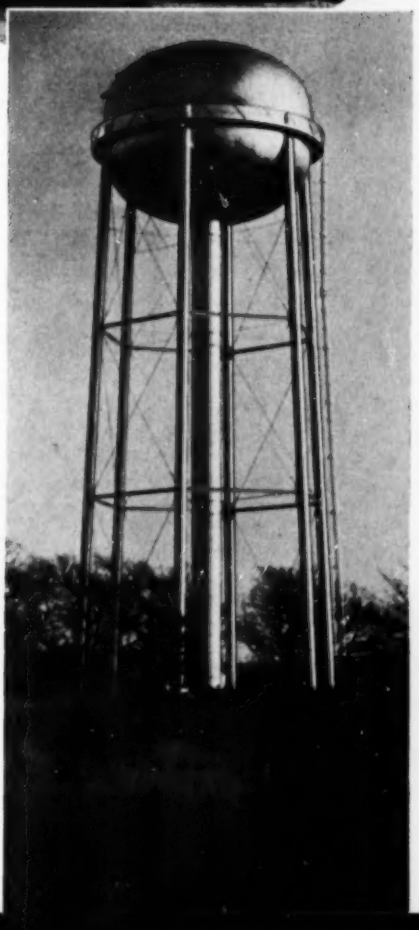
AT DARTMOUTH, MASS.

North Tank—500,000 gallon Double-Ellipsoidal unit. Tower height 39 ft.

PITTSBURGH •DES MOINES

Elevated Steel Tanks

The widely-spread community of Dartmouth, Massachusetts enjoys dependable water service at uniform pressures, thanks to three strategically-located P-DM Elevated Steel Tanks. The first tank, built in 1947, served the central area. Recent addition of the North and South units provides a completely balanced storage system. *Write for our Modern Water Storage Brochure.*



South Tank—300,000 gallon Double-Ellipsoidal design. Tower height 104 ft 3 ins.

PITTSBURGH•DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH (25) 3418 Neville Island	DES MOINES (8) 919 Tuttle Street
NEWARK (2) 218 Industrial Office Bldg.	DALLAS (1) 1223 Praetorian Bldg.
CHICAGO (3) 1222 First National Bank Bldg.	SEATTLE 526 Lane Street
LOS ANGELES (48) 6399 Wilshire Blvd.	SANTA CLARA, CAL. 625 Alviso Road

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VOL. 100, NO. 9 SEPTEMBER 1953

WATER & SEWAGE WORKS

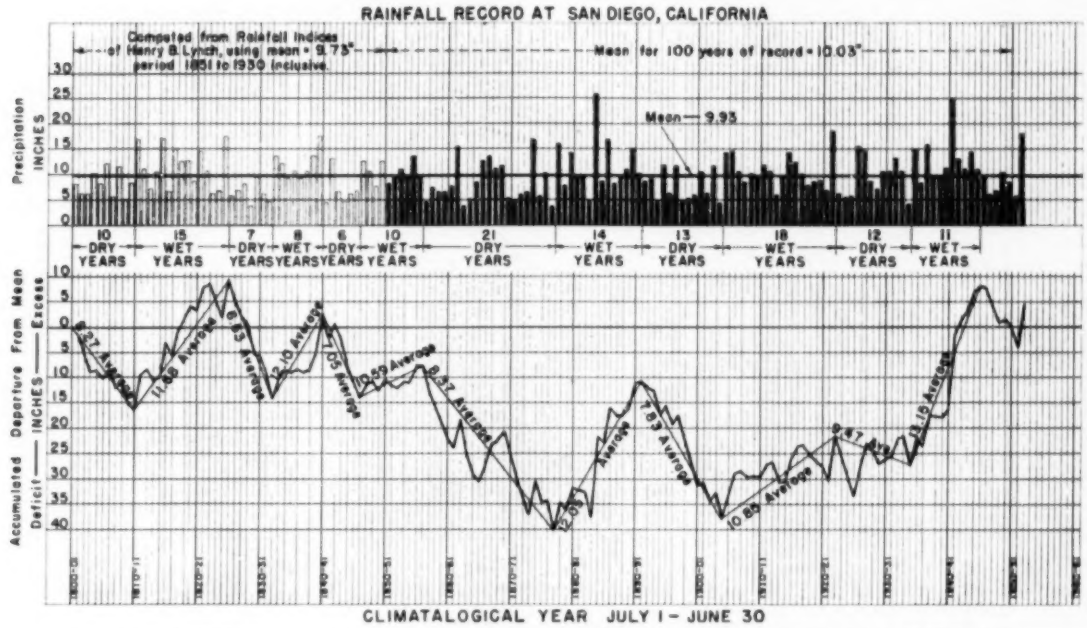
RAINFALL RECORD AT SAN DIEGO, CALIFORNIA
Computed from Rainfall Indices of Henry B. Lynch, using mean = 9.75" period 1851 to 1930 inclusive.
Mean for 100 years of record = 10.03"
Precipitation INCHES
Mean — 9.93
10 DRY YEARS
15 WET YEARS
7 DRY YEARS
8 WET YEARS
6 DRY YEARS
10 WET YEARS
21 DRY YEARS
14 WET YEARS
13 DRY YEARS
18 WET YEARS
12 DRY YEARS
11 WET YEARS
Accumulated Departure From Mean
Deficit — INCHES — Excess
CLIMATALOGICAL YEAR JULY 1 – JUNE 30

Fig. 1—RAINFALL record at San Diego, Calif., 1800-1953 reveals 100 yr. mean of but 10.03 inches.

San Diego Aqueduct Capacity Restored by Chlorination

Initial continuous chlorination now supplanted by more economical programmed chlorine application.

by **LEE STREICHER**, *Chief Chemist, Metropolitan Water Distr. of Southern California, La Verne, California.*

DOMINANT among the factors which are reflected in the past history and which control the future growth of southern California is the struggle for water. Located in a semi-arid section of the United States, this region has too little rainfall to provide for the needs of its agricultural, industrial and urban areas. Only by drawing upon the once tremendous supply of underground water accumulated over thousands of years has the phenomenal growth of this area been made possible. With the continuing growth in population and industry, the draft on the underground water reserve has increased until it now exceeds the replacement by many million gallons of water each day. Where feasible, storage reservoirs have been constructed in an effort to conserve and utilize to a maximum the limited and variable water supplies available from the upland and mountain streams. These have long since proved wholly inadequate to meet the constantly increasing demands for water. Even in San Diego County, where for many years the waters impounded during wet reasons provided satisfactorily for the demands during subsequent dry periods, the present use of water is about 25 per cent greater than the safe yield of these impounding reservoirs.

The only logical solution to this problem lay in the importation of sufficient water from a dependable, adequate and reasonably close source to provide for present needs and those of the foreseeable future. The Colorado River was such a source.

Metropolitan Water District Formed in 1927

In 1927 the Metropolitan Water District Act was adopted by the California legislature and in 1928 the Metropolitan Water District of Southern California was organized to bring in the water of the Colorado

Fig. 2—AQUEDUCT of San Diego County Water Authority
Point of chlorine application San Jacinto Regulating Reservoir near head of aqueduct.

River. The voters of the cities comprising the District authorized a bond issue to finance the construction of the now famed Colorado River Aqueduct and all necessary appurtenances to bring Colorado River water to these cities and contiguous areas, the whole project to be paid for solely by the taxpayers and water users of the District. Construction of the aqueduct was started in 1932, and the first water was delivered in Los Angeles metropolitan area in June, 1941.[1, 2]

Wartime augmented demands pinpointed the critical water shortage in the San Diego area. By agreement with the other Southern California agencies concerned, the city and/or county had already been apportioned an annual quota of 112,000 acre feet of Colorado River water, but no facilities were available for delivery of any of this to the vicinity of San Diego. In December of 1944 President Roosevelt approved an emergency appropriation for construction of an aqueduct from the west portal of San Jacinto tunnel (on the Colorado River Aqueduct) to San Vicente reservoir of the San Diego water system—(Fig. 2). Although some delay in construction was occasioned by an acute shortage of labor and materials, the initial flow of Colorado River water passed through this vital link into San Vicente reservoir on November 24, 1947. Design and construction of this aqueduct was under Navy supervision.

On December 17, 1946 the corporate area of the San Diego County Water Authority officially became annexed to the Metropolitan Water District of Southern California. The District assumed payment of one half the cost of construction of the San Diego Aqueduct and, upon completion of the line, took over operation of the northerly one half of the system.

Aqueduct Design Features and Operating Characteristics

The first barrel of the San Diego Aqueduct (Fig. 2) designed for an initial capacity of 85 cubic feet per second, is 71.1 miles long and consists of 4.4 miles of 72-inch diameter tunnel; 2.0 miles of 96-inch and 12.4 miles of 72-inch diameter reinforced concrete pipe; 21.8 miles of 54-inch and 28.8 miles of 48-inch diameter precast concrete pipe; 1.1 miles of steel pipe; and a regulating reservoir with available storage of 1400 acre feet 0.6 mile in length located two miles from the takeout at San Jacinto tunnel. When the aqueduct was designed, it was intended that the capacity would be increased ultimately to 165 c.f.s. Because of the subnormal rainfall in this area in recent years and the increasing demand for water, the second barrel is already under construction.[3]

Early in December, 1947 extensive tests of the carrying capacity, operating characteristics and hydraulic properties of the aqueduct were made. The results of these tests were very satisfactory and indicated that the maximum carrying capacity of the line was more than 20 per cent above the normal design figure.

Loss in Capacity a Serious Matter

Because of the great need for water in the San Diego area, every effort was made to operate the feeder at its maximum capacity. Flow at a rate of approximately 104 c.f.s. was maintained continuously until the middle of June, 1948. On June 14th it was observed that the water level was unusually high in the outlet structure at the San Jacinto Regulating Reservoir. An inspection revealed that the water was backing up in the aqueduct and that the freeboard at each of the open structures along the line was noticeably reduced. Within a few days it was necessary to reduce the rate of flow to less than 96 c.f.s. in order to keep some of the vent structures from overflowing. It was suspected that biological growths within the pipe were responsible for the reduced carrying capacity, and microscopical examination of several samples of deposit removed from a number of points along the line confirmed this.

Chlorination Tried as Remedial Measure

Chlorination of the water entering the San Diego Aqueduct, in an attempt to remove and control bacterial growths and biological films, was started on July 7 at which time the flow in the line was about 94 c.f.s. Two 1-ton cylinders of chloride were connected by a pipe manifold from which chlorine gas was fed into the aqueduct through a 2-inch rubber hose weighted at the discharge end to keep it submerged. The point of application was just below the outlet gate from San Jacinto Reservoir. On the basis of earlier chlorine demand tests which had been run on natural Colorado River water, an initial dosage of 3.5 to 4 ppm of chlorine was applied in order to carry a free-chlorine residual of about 1.0 ppm to the last open structure on the District's portion of the feeder. This rate of chlorine application was continued for 6 days, after which it was reduced to about 2.5 ppm. By July 19 (12 days of chlorination) the reservoir discharge had been increased to 99 c.f.s. When a carrying capacity of 100 c.f.s. was attained eight days later (July 27), no further increases in flow were sought. The freeboard at the structures continued to increase, however, and by November 1 was back to normal for 104 c.f.s. flow.

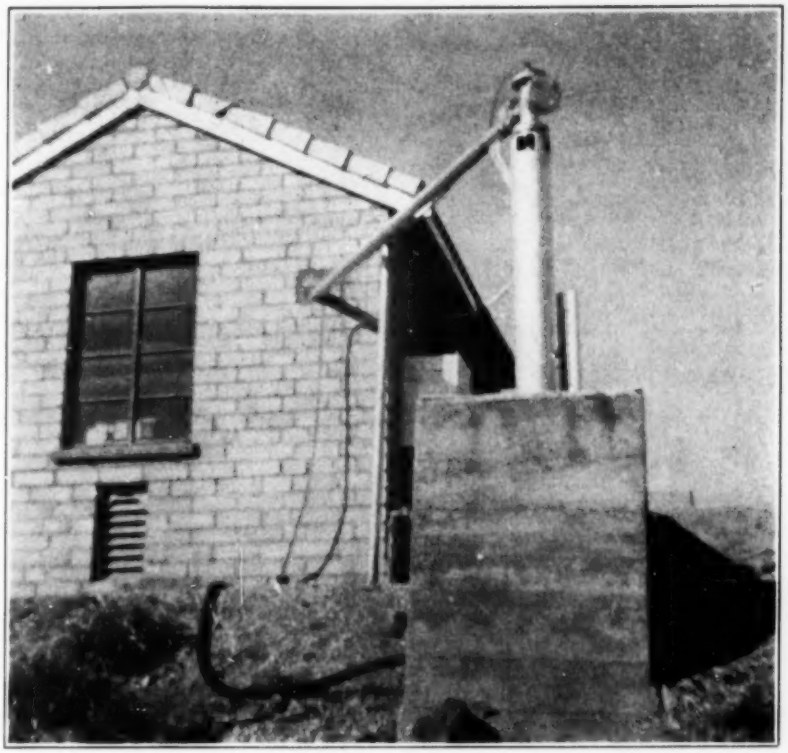

Fig. 4—CHLORINE inlet arrangement on aqueduct
Chlorine gas at regulated pressure is conveyed through ⅝" plastic hose which connects into 2" "Uscolite" pipe leading to chlorine inlet structure.

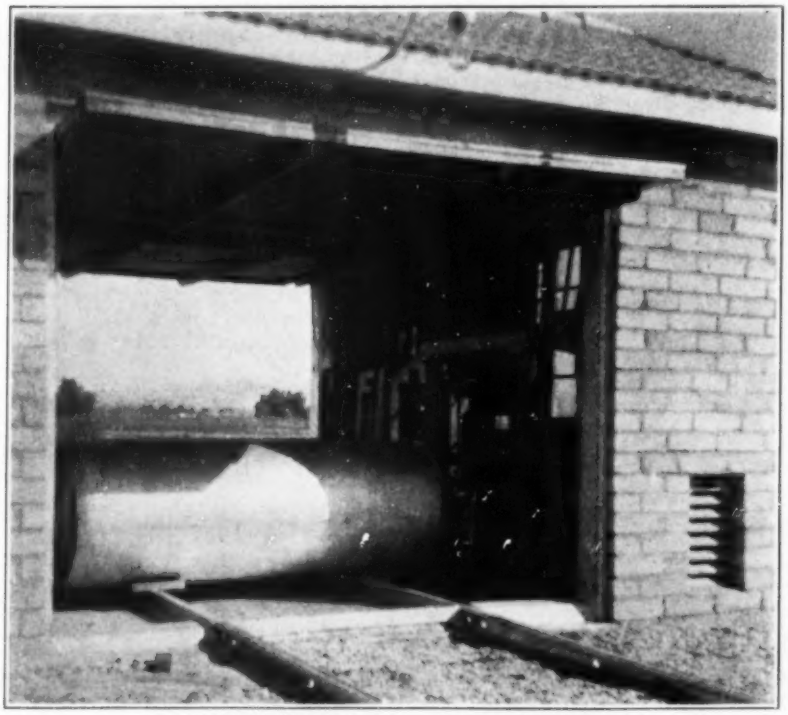

Fig. 3—CHLORINATING station at San Jacinto Reservoir
One-ton chlorine container on platform scale; W. & T. chlorinator in far corner on right.

Continuous Chlorination for Combined Chlorine Residual

On October 16 a chlorinator was installed at the reservoir outlet (Fig. 3) and the chlorine dosage was reduced to between 0.5 and 0.6 ppm. This dosage was selected as a result of chlorine demand tests which had shown that the maximum combined-chlorine residual could be obtained from this rate of chlorine application to the water in San Jacinto Reservoir at that time. The chlorinator was a Wallace & Tiernan solution feeder with a rated capacity 1000 pounds of chlorine per day. An 8-inch diameter hole was cut through the top of the 72-inch I.D. concrete pipe about 20 feet downstream from the outlet gate from the reservoir, and a concrete chimney with a 12-inch I.D. opening was built over this hole to provide access to the surface. A 2½-inch steel pipe was installed in this chimney, terminating at a point about two feet above the invert of the aqueduct line. This structure is pictured in Fig. 4. The rubber hose carrying the discharge from the chlorinator was passed through the steel pipe, so that the chlorine solution might be applied as far below the surface of the water as practicable. No diffuser was used.

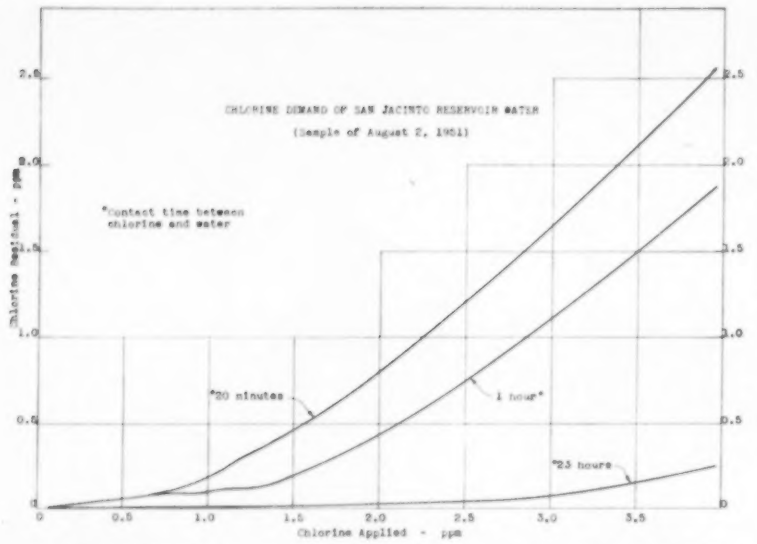
CHLORINE DEMAND OF SAN JACINTO RESERVOIR WATER
(Sample of August 2, 1951)
*Contact time between chlorine and water
*20 minutes
1 hour*
*25 hours
Chlorine Residual - ppm
Chlorine Applied - ppm

Fig. 5—CHLORINE DEMAND curves for San Jacinto Reservoir water Oct. 31, 1950

At intervals of one to three months, chlorine demand curves were prepared from tests run on the reservoir water samples. On the basis of these data, the chlorine dosage was varied, as necessary, to maintain the maximum obtainable combined-chlorine residual. The chlorine dosage required to maintain this condition ranged from 0.5 to 1.1 ppm, depending upon the quantity of nitrogenous material present in the water—(Fig. 5). Occasionally, particularly in midsummer when water temperatures were at a maximum, the carrying capacity of the feeder would start to decrease slowly despite this continuous chlorination. Happily, application of chlorine at a dosage of about 3 to 4 ppm (Fig. 6) for 18 to 24 hours always restored the freeboard at the structures and the capacity of the line. For 10 months during the period from April 1951 to March 1952, a flow rate of more than 106 c.f.s. was maintained in the San Diego Feeder, a peak of 106.7 c.f.s. being attained. Comfortingly, this was fully 25 per cent more than the designed capacity of the line.

Early in the summer of 1951 chlorination practice at San Jacinto Reservoir was modified to the extent that the higher dosage of chlorine (3 to 4 ppm) was applied at more frequent intervals but for only 2 to 6 hours during each period of application. Between these periods normal chlorination to the "hump" point on the breakpoint curve was still continued—(Fig. 5).

So successful did this procedure prove to be that it was decided to experiment with the use of intermittent high-dosage chlorination alone, without continuous low-dosage chlorination. While plans for this were in progress, the article by Jackson and Mayhan[6] appeared, in *Water & Sewage Works*, describing the experience at Little Rock in maintaining supply line capacity by chlorination. This article confirmed the idea that continuous chlorination might not be necessary.

Intermittent Chlorination for Free Residual

Late in the fall of 1951 continuous chlorination at the San Diego Feeder was discontinued, and the program of chlorinating for 2 hours every day at a chlorine dosage of 2 to 3 ppm was instituted. When this schedule proved highly satisfactory, the frequency of chlorination was further reduced. At present, chlorine is applied twice each week, 100 pounds being used during each two-hour period of application. This is equivalent to a chlorine dosage of about 2.2 ppm for 2 hours at the current 100 c.f.s. rate of flow in the feeder. Aqueduct capacity is being very satisfactorily maintained, and freeboard at all the open structures is at a maximum. During the hottest summer months it may sometimes be necessary to increase the dosage temporarily—possibly to 150 pounds or even 200 pounds for 2 hours twice each week. Even at the latter dosage, however, the total chlorine used will add up to only 400 pounds per week. Compared with a usage of 300 to 600 pounds per day when continuous low-dosage chlorination was practiced, this represents a very substantial saving.

As the chlorinator formerly used for continuous low-dosage chlorination has a maximum capacity of about 960 pounds per day or 40 pounds per hour, it is not suitable for the present intermittent, higher-dosage chlorination. Instead, the chlorine gas drawn from the one-ton cylinders passes through a manifold into a pressure regulator. At reduced pressure it enters a ⅝" plastic garden hose which, in turn, is carried through a two-inch "Uscolite" pipe leading through the inlet structure into the aqueduct line. The plastic hose extends for a short distance along the invert of the 72" pipe, permitting the gas to bubble upward into the flowing water. Although a larger chlorinator, which would permit application of chlorine solution rather than chlorine gas, would simplify control of chlorine dosage and, perhaps, promote more efficient use of the chlorine applied, even the present equipment is effectively maintaining full capacity in

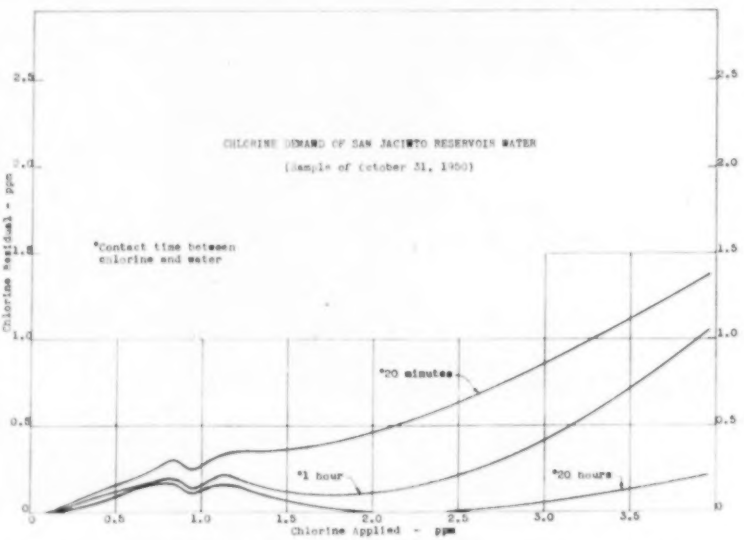
CHLORINE DEMAND OF SAN JACINTO RESERVOIR WATER
(Sample of October 31, 1950)
*Contact time between chlorine and water
*20 minutes
*1 hour
*20 hours
Chlorine Residual - ppm
Chlorine Applied - ppm

Fig. 6—CHLORINE DEMAND curves for San Jacinto Reservoir water Aug. 2, 1951

the San Diego Aqueduct at very moderate cost and simplicity of operation.

Acknowledgments

The author wishes to acknowledge the cooperation received from T. J. Cain, Division Foreman, San Diego Aqueduct, and from the District's softening and filtration plant laboratory staff.

The Metropolitan Water District of Southern California is operated under the direction of Robert B. Diemer, General Manager and Chief Engineer.

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(2) "Colorado River Aqueduct," Booklet. 76 pp.—published by the Metropolitan Water District of Southern California

(3) Diemer, R. B. "Expansion of the Colorado River Aqueduct System", Jour. A.W.W.A. 45: 397-404 (1953)

(4) Jackson, L. A. and Mayhan, W. A. "Chlorination Maintains Supply Line Capacity", Water & Sewage Works 98: 248-252 (1951)

Accident Prevention Handbook for Safety Program Organization

The National Safety Council's new "Handbook of Accident Prevention for Business and Industry" is a convenient safety guide. The handbook shows how to set up and maintain a safety program. Detailed information is included on subjects such as plant layouts, materials handling, housekeeping, machine guarding, electrical hazards, pressure vessel hazards, first aid, fire prevention and personal protective equipment.

The handbook advises the small business man who cannot afford to employ a full-time safety specialist how to make use of outside assistance. Service and insurance organizations, governmental agencies, trade associations and professional societies which can help the small operator are described. It contains 94 profusely illustrated pages and several check lists.

For further information and prices, write the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

New A.W.W.A. Standards for Asbestos-Cement Pipe

Tentative specifications for asbestos-cement water pipe have been published by the American Water Works Association, 521 Fifth Ave., New York 17, N.Y., and may be obtained upon advance remittance of 20c.

Known as AWWA C400-53T, the 8-page booklet covers asbestos-cement pipe for the conveyance underground of water at maximum working pressures of 100, 150, and 200 psi (pounds per square inch). Nominal pipe diameters covered by the specifications range from 4 to 36 inches.

Requirements for flexural, bursting, and crushing strength are given, together with directions for conducting the necessary load, hydrostatic, and three-edge bearing tests.

The specifications were prepared by its Working Committee (S. M. Clarke, chairman) for the A.W.W.A. Committee on Water Works Practice (L. R. Howson, chairman).

Miami's Sewer Revenue Bonds in Demand

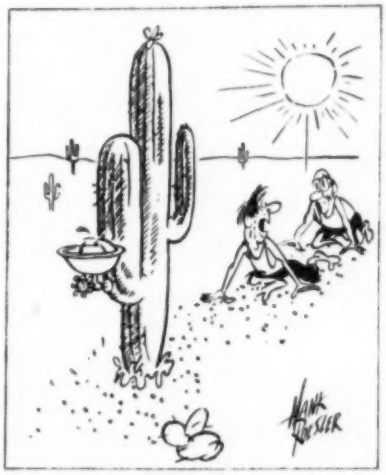
With especial interest we have noted the boost given the new City of Miami Sewer Revenue Bonds, which are listed as a bargain amongst tax exempt issues by *Forbes Magazine*. These bonds carry an "A" rating and return a yield of 4.25% for the 1993 maturity date.

Just why these bonds are so well received in the financial world is disclosed by the statement that for tax payers whose top bracket is 60% obtain very nearly the same net return from these bonds as from a 12% return of taxable income.

Alvord, Burdick & Howson Announce New Partners

The Chicago consulting engineering firm of Alvord, Burdick & Howson—Chas. B. Burdick, Louis R. Howson, and Donald H. Maxwell—has announced that six additional engineers have been admitted to the firm.

The new partners, all of whom have been with the firm for many years are: Reed I. MacDonald, Edward E. Erickson, George J. Rettig, Russell E. Crawford, Philip G. Odgers, and Arthur W. Howson.



"C'mon 'Bill': Always hearn that these here big cactuses had water in 'em."

Brock Therrell Now Manager of Johnson City Water and Sewage Dept.

P. Brock Therrell, former assistant superintendent of the Greenville, S.C., Water Dept., tendered his resignation effective August 1, to accept appointment as manager of the Water and Sewer Dept. of Johnson City, Tenn.

Mr. Therrell, a graduate engineer from the Univ. of South Carolina, prior to joining the Greenville Water Dept. some four years ago, was connected with the consulting engineering firm of J. E. Sirrine & Co. of Greenville. He takes over his new position after a wealth of experience during the phenomenal expansion program of the Greenville Water System under supervision of John Hawkins, longtime superintendent of the Greenville system.

Fellowships Available at Rutgers University

The Dept. of Sanitation of Rutgers University has several graduate fellowships leading to an M.Sc. or PhD. degree available for chemists, biochemists, chemical engineers and sanitary engineers interested in research and study in the field of water, sewage and industrial waste treatment and stream pollution.

All appointments are on a twelve month basis with one month vacation and tuition is free. Salaries range from $1200 per year for a half time research fellowship to $2400 for a research assistantship requiring a master's degree.

Further information can be obtained by writing to Dr. Harold E. Orford, Dept. of Sanitation, Rutgers University, New Brunswick, N. J.

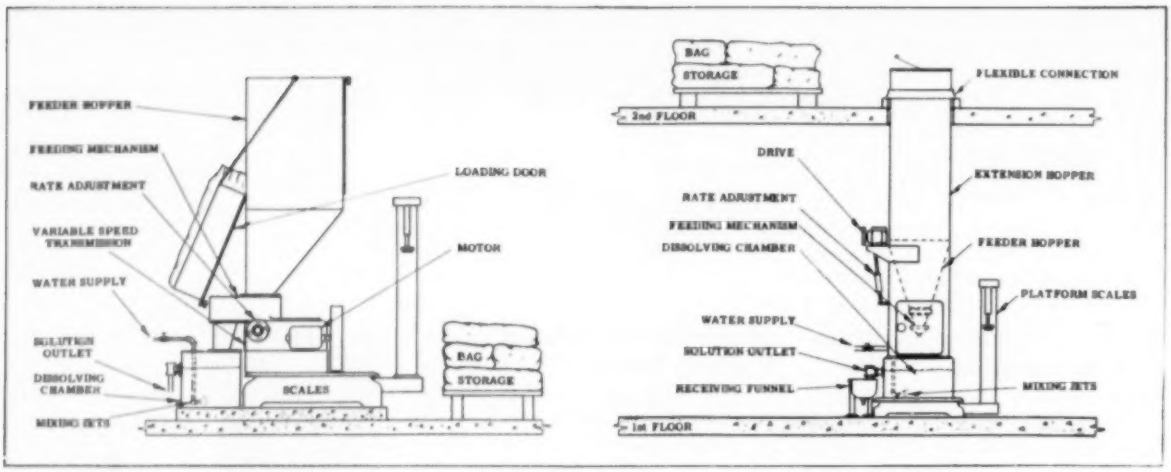


Fig. 1—Small Unit feeder installation
Low feed rate—small chemical storage.

Fig. 2—Two Floor feeder installation
Low or high feed rate—second floor chemical storage.

Guides for Selecting Chemical Feeders*

by PAUL A. COFFMAN, Jr., Chief Engr., Omega Machine Co.
Providence, R.I.

AT some time in his career, nearly every waterworks operator is faced with the problem of designing a chemical feeder installation, and of selecting and purchasing the equipment. The final success of the feeder installation depends largely upon the thought and study given to the problem before equipment is purchased.

The science of handling and proportioning chemicals for water treatment has advanced to the point where standard equipment is available from several manufacturers for solving practically any feeding problem. The choice or selection of chemical feeding equipment to fit a particular situation likewise can be standardized within certain limits and it has been possible to develop guides for the selection of this equipment.

Once the water treatment process to be used has been decided on with competent technical advice from the consultant, it is time to select chemical feeding equipment. Such advice should include a decision as to the chemical to be used, whether it will be fed in dry or liquid form, the point of application, and due consideration of availability, cost, quantities to be handled, solubility and stability of the chemicals which can be used.

This paper deals with guides for the selection of dry chemical feeding equipment. A future paper will deal with liquid feeding equipment. There are eight principal guides for selecting dry chemical feeding equipment.

Guides for Selecting Dry Chemical Feeding Equipment

1. Define
Operational Requirements

2. Determine
Storage Capacity Required

3. Choose
Best Available Location

4. Choose
Type of Installation

5. Choose
Type of Feeder Preferred

6. Select
Accessories Desired

7. Furnish
Information for Manufacturers

8. Evaluate
Proposals Submitted

Guide No. 1—
Define Operational Requirements

1. Determine the feed rate requirements for the installation. It is important to give careful consideration to the actual maximum and minimum rates of feed required. If minimum and maximum rates required are not carefully determined, equipment manufacturers may be forced to offer larger or more expensive equipment than is actually needed for the job.

2. Decide on the degree of accuracy required. If the process is critical and chemical feeding must be precise, a per cent plus or minus tolerance is probably all that can be allowed and gravimetric feeders must be used. On the other hand, if the chemical treatment required can vary some, without seriously affecting the process and a considerable retention period is available for ironing out variation in dosage, then a feeding accuracy varying from three to five per cent from the selected feed rates may be satisfactory, and volumetric feeders can be used.

3. Decide on the records which will be required for this process. If

*A paper presented before the New England Water Works Assn., and here printed with permission of the Association.

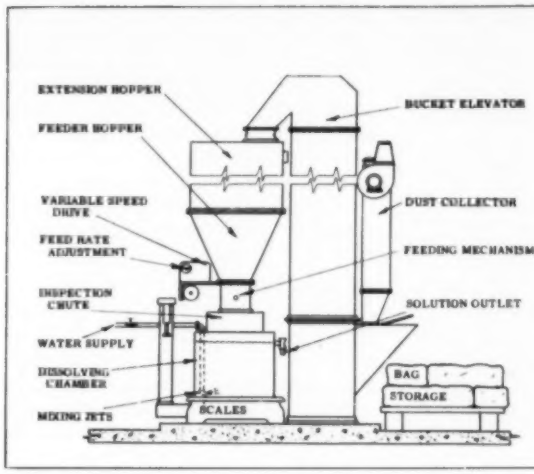


Fig. 3—Mechanical loading installation
High feed rate—large hopper capacity.

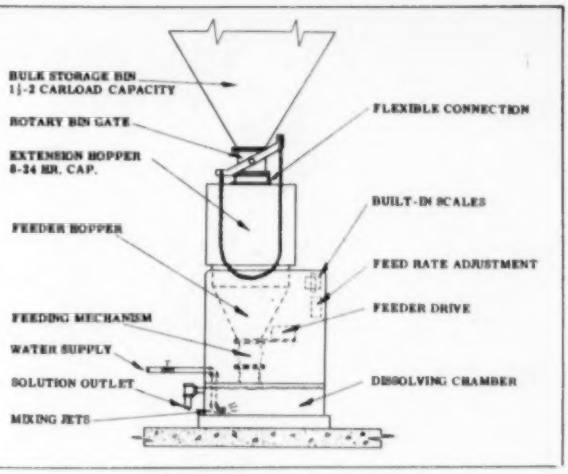


Fig. 4—Bulk storage feeder installation
Low or high feed rate—storage in overhead bins.

it is desirable to have totalizers and recorders, then gravimetric feeders should be specified. A log sheet record can be had with volumetric feeders provided they are installed on platform scales. If no scales are furnished, then the only reliable record will be an accurate count of bags of material used on a daily basis. For very low feed rate installations, the bag count method will not be satisfactory because only one or two bags of chemical will be used in a twenty-four hour period.

4. Decide on the type of controls required for the installation. This includes a decision on whether the equipment will be manually controlled or automatic. If the rate of flow through the water plant varies considerably then proportional pacing may be required. If the feeder installation is for a well station, automatic start-stop control in parallel with pumps may be desirable. For some installations where the feeder is to be installed in a rather isolated location or where man-power is limited, remote control of the feeding equipment may be an economic necessity.

Guide No. II—
Determine Storage Capacity Required

1. Storage in a chemical feeder installation is an important consideration from the standpoint of labor saving and purchase of chemicals in economical quantities. All feeders should have an initial hopper capacity, equivalent to not less than four nor more than twenty-four hour storage when feeding at the maximum required rate of feed. If manpower for dumping chemicals is available on all three shifts then four to eight hours capacity will be satisfactory; otherwise, provide capacity for twenty-four hour operation.

2. Bag or bulk storage capacity must be determined on the basis of economical purchase and transportation quantities, and time required for delivery from suppliers. Sixty to ninety days' supply is the usual bag or bulk storage requirement. If the chemical is to be stored in bags, due consideration must be given to the floor space required for such storage and means for handling the bags in the most economical manner.

All bag chemicals should be stored on pallets to keep them dry and the chemical storage space should be well-ventilated to prevent chemicals from absorbing moisture during storage and becoming difficult, if not impossible, to feed satisfactorily in dry feeders. If more than a few bags of chemical per day are to be handled, it may be economical to provide lift trucks for transporting the pallets of bagged chemical from one feeder installation to another.

3. When the chemical is to be stored in bulk, bins must be large enough to hold at least one and one-half times the normal shipping quantity. If the water plant is a great distance from the source of supply, there is a chance of delay in transit and additional storage capacity should be provided, so there will be no danger of the plant running out of chemical between shipments. The usual practice is to provide a minimum of from one and one-half to two carload storage capacity when chemical is purchased in bulk.

Guide No. III—
Choose Best Available Location

1. The hydraulics of a chemical feeder installation should be studied very carefully before selection and purchase of equipment and solution lines. Whenever possible choose a location that will permit the dry chemical to flow entirely by gravity from the storage level to the feeder and dissolving chamber, then by gravity from the solution chamber to the point of application. Such accessories as conveyors, pumps and ejectors should be eliminated if possible.

2. If a location is not available with these ideal conditions, then choose the location that will require as little pump or ejector head as possible. This is particularly important in the feeding of alkaline chemicals when hard water is used in the dissolving chamber. Pumps and ejectors on chemical solution lines always require frequent cleaning and servicing and their use should be avoided whenever possible.

Guide No. IV—
Choose Type of Installation

There are four basic types of dry chemical feeder installations:

1. *Small Unit Feeder* (Fig. 1) used when a very low feed rate and small chemical storage capacity is required. The principal parts are: feeder hopper, feeding mechanisms, means for feed rate adjustment, variable speed transmission or equivalent, water supply for mixing jets in dissolving chamber, dissolving chamber sized for adequate detention of the chemical being fed, and platform scales for an accurate check on the performance of the equipment.

2. *Two-floor Installation* (Fig. 2) used for low or high feed rate with bin storage on the second floor. This installation contains the same essential parts as the small unit feeder installation plus an extension hopper for additional storage capacity. This type of installation has the advantage that all chemical is handled in a separate room on the second floor—thus

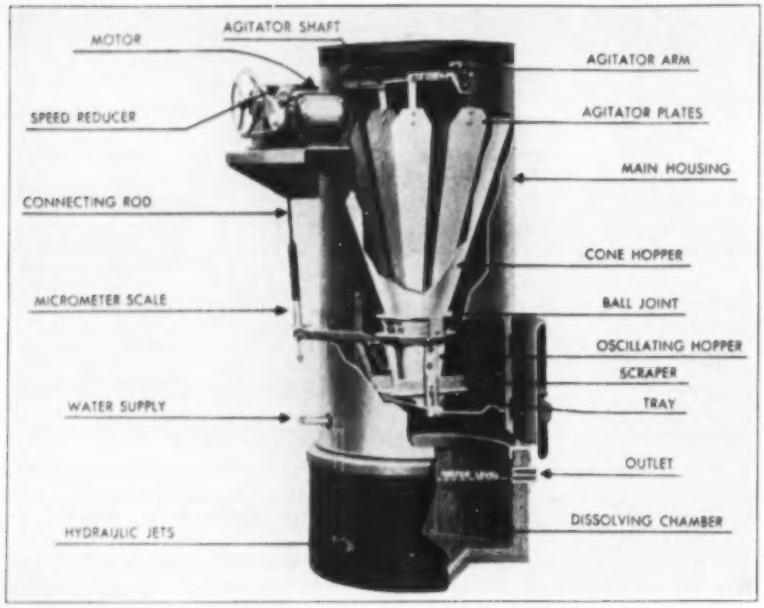


Fig. 5—OMEGA Universal volumetric feeder

confining to the chemical storage room, dust and dirt incident to handling bagged chemicals. An ideal refinement, highly desirable but not absolutely essential, is a dust collector installed on the extension hopper at the second floor level to eliminate dust in the chemical storage room while loading the hopper.

3. *Mechanical Loading Installation* (Fig. 3) used when the feed rate is high and large hopper capacity is required with bag storage on the first floor. Here again, the essential parts of the chemical feeder installation are included plus an extension hopper, bucket elevator and dust collector. This type of installation is frequently used when new and larger capacity equipment is installed in an existing chemical building. It is also used for new installations with adequate floor space available on one floor for the equipment and chemical storage. (Considerable savings can sometimes be realized by eliminating the second floor of the chemical building.)

4. *Bulk Storage Bin Installation* (Fig. 4) used for high or low feed rate requirements where chemical is purchased in bulk, usually truckload or carload quantities, and stored in overhead bins. This type of installation is used mostly by large plants where it is economical to purchase chemicals in carload quantities.

These storage bins are usually constructed of concrete or steel and are an integral part of the building. It is considered good practice to make the lower section of the storage bin of steel so that vibrators, plate type agitators or other agitating devices can be readily installed. A bin installation can be made suitable for practically any type of chemical feeder by fabrication of the steel hopper action to meet installation requirements. Large storage bin installations should include a large rotary bin gate on the outlet of the bin. Minimum size gate 9 x 15 inches, 12 x 12 inches, or preferably 12 x 24 inches. When small bin gates are used on large bins, packing at the bin outlet can be expected.

If the chemical to be stored is of a non-free-flowing type subject to arching and flooding, means for agitation must be provided to insure a flow of material from the storage bin when required. On installations handling a floodable material, the feeder selected should have a Rotolock feeding mechanism incorporated in it to eliminate the danger of flooding through the feeder.

Chemical feeder installations under large storage bins should be isolated from the storage bin by means of dust tight flexible connections to prevent damage to the equipment due to expansion and contraction of the large storage bin. The installation shown in Fig. 4 contains all the essential elements of a chemical feeder installation plus the flexible connection, rotary bin gate and bulk storage bin.

Guide No. V—
Choose Type of Feeder

There are two basic types of feeding mechanisms: volumetric and gravimetric.

When variations of three to five per cent plus or minus (by weight) can be tolerated in the feed rate, and when it is not necessary to accurately record or totalize the actual weight of material fed, then volumetric feeders may be used. When more accurate feed rates (within plus or minus one per cent by weight) are desired and when automatic control of feed rate and accurate records of feed rate are required, then gravimetric feeders may be used.

Volumetric Feeders

Volumetric feeders are designed for volume displacement. They do not incorporate scales in their feeding mechanism. If scales are used they are usually platform scales supporting the entire machine and its contents.

Such scales give a check on the performance of the machine, but do not actually control the rate of feed. Any changes in density or feeding characteristics of the chemical being fed will directly affect the actual weight of material fed. Inasmuch as volumetric feeders measure only the volume displaced and not the weight of the material, it is possible for a volumetric feeder to operate mechanically without feeding any material, and there is no means of warning the operator if material is not being fed. For these reasons volumetric feeders usually require more attention from the operators to insure continuous satisfactory operation of the process.

Volumetric feeders can be used in small plants where:

Fig. 6—W&T volumetric feeder A-635
With scales for weight checks.

1. Operation rates are relatively constant.

2. Continuous check on performance of the equipment is possible—for example, regular visits by the operator every half hour or hour, and checks of the material fed by means of platform scales.

3. Considerable retention capacity in the mixing and settling basins is available to average the minor variations in feed rate due to changes in bulk density or feeding characteristics of the chemical.

Typical volumetric feeders include the Omega Universal, Rotolock, and Disc Feeders; Wallace & Tiernan Series A-635, Type NA and Type A-552; Infilco Type D and Type E; and Syntron Vibratory Feeders.

The Omega Universal Feeder (Fig. 5) is readily adaptable for feeding any of the dry chemicals used in water plants. The feeding mechanism is the large open oscillating throat type. It is accurate volumetrically and is not readily plugged by lumps or trash. Rate of feed is adjustable over a wide range. These machines are manufactured in three sizes with suitable accessories for any of the four types of installations previously described. The principal advantages of using this type of machine are—low first cost, simple operation, and low maintenance service.

The Wallace & Tiernan Volumetric Feeder, Series A-635 (Fig. 6) incorporates a feeding mechanism of the horizontal screw type utilizing a combination of rotary and axial movement through a feed trough discharging chemicals at both ends. The rate of feed is regulated by a cam operated clutch mechanism by means of a control crank. This machine is primarily offered for unit type installations.

The Wallace & Tiernan Type MA Feeder consists of a slow moving feed roll delivering a ribbon of chemical across the feed apron from which it is fed to point of discharge. Changes of feed rate are made by varying the width of the ribbon and by change gears. The Wallace & Tiernan Type A-552 Feeder has the same type of feeding mechanism as the Series A-635 Feeder.

The Infilco Volumetric Feeder, Type D, (Fig. 7) is a disk-type (revolving table) feeder with position of a feed knife on the disk determining the rate of feed. The Type E machine (Fig. 8) is an extrusion type feeder with a feed pan underlying the hopper and moving with a rocking and reciprocal motion. These machines are primarily used for small unit feeder installations.

Fig. 7—INFILCO volumetric feeder Type D
With revolving table.

Fig. 8—INFILCO volumetric feeder Type E
With revolving feed pan.

The Omega Rotolock Feeder (Fig. 9) is a star wheel or pocket drum type of feeder and is recommended for volumetric feeding of floodable materials such as hydrated lime, activated carbon, clay, etc. The feeding mechanism is entirely enclosed and is driven by an infinitely variable speed transmission (100 to 1 range). It is available with electric or pneumatic rate setting devices for use with automatic pH controllers and proportional pacing systems. Accessories for the Rotolock Feeder are available for all four types of installations.

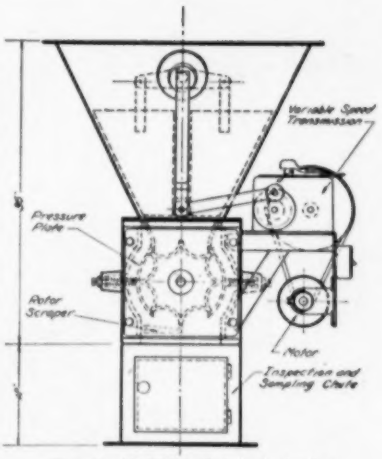


Fig. 9—OMEGA Rotolock feeder

Omega Disc Feeders (Fig. 1) are used for feeding finely ground materials continuously and accurately at very low rates of feed. When the maximum feed rate required is less than 50 pounds per hour, the Disc Type Feeder should be considered. The feeding disc has a scroll type feeding orifice which provides exact volumetric measurement. Delivery of material is continuous even at very low rates, and directly proportional to the number of revolutions of the disc. An infinitely variable speed drive rotates the disc at the desired speed. Machines with a feeding range as low as one to 25 ounces per hour are available. This machine may be equipped with any of several sizes of feeder hoppers including the loading door hopper, all suitable for hand filling from feeder room floor. This machine is generally used for unit feeder installations requiring low feed rates and small chemical storage capacity.

Gravimetric (Weighing) Feeders:

Gravimetric or weighing feeders are machines designed to feed dry chemicals continuously and accurately by weight. They are to be preferred because of their greater feeding accuracy, wide feeding range, and because automatic controls, alarm devices, totalizers and recorders are readily incorporated into the machine. The rate of feed can be pre-set and the feeder will maintain its set rate of feed by weight regardless of changes in bulk density or flowing characteristics of the chemical being fed. They are easily fitted with accessories for accurate automatic proportional pacing from flow meters.

Gravimetric feeders are manufactured in two types: Belt gravimetric

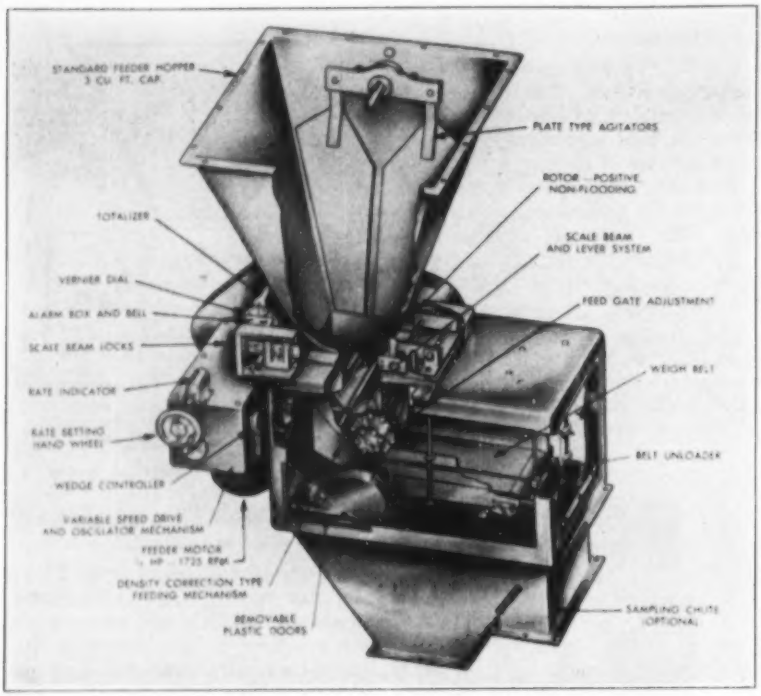


Fig. 10—OMEGA Chemizer belt type gravimetric feeder
With positive non-flood rotor.

and Loss-In-Weight gravimetric feeders. Typical belt type gravimetric feeders include the Omega Chemizer, the Wallace & Tiernan Merchen Feeder, the Jeffrey Waytrol, and the Syntron belt Gravimetric Feeder.

In the Omega Chemizer (Fig. 10) dry chemical enters the feeder at the top, either from an extension hopper or chute, and passes to the feeding mechanism where it is fed to the scale supported weigh belt which delivers the chemical to the outlet of the feeder. The scale controls the feeding mechanism to maintain a precisely uniform weight of chemical on the weigh belt regardless of changes in density.

Adjustment of the feed rate of the Chemizer may be made in two ways; by setting the counterpoise weight on the scale beam to increase or decrease the weight on the weigh belt and allowing the belt to run at a constant speed; or by the preferred method of maintaining a constant weight on the belt and varying the belt speed. The scale beam and suspended Omega wedge controls the amplitude of vibrations of the feed tray which delivers chemical to the weigh belt.

When the chemical to be fed is compressible, finely ground and subject to arching and flooding from a storage hopper, a non-flood Rotolock (Fig. 9) is installed above the feed tray in the feeding mechanism.

The Wallace & Tiernan Merchen Feeder (Fig. 11) is of the belt gravimetric type. It incorporates a weigh span between the head and tail rollers of a small conveyor belt, and mercury switches actuated by the scale beam increase or decrease the opening of the feed gate to vary the load on the weigh span. Rate of feed is usually set by adjusting the weight on the scale beam.

The Syntron belt gravimetric feeder (Fig. 12) consists of a short constant speed conveyor belt supported by a small platform scale, and electric vibratory feeding mechanism, and electric or pneumatic controller. Rate of feed is controlled by varying the load on the conveyor belt.

A typical Loss-in-Weight Gravimetric feeder is the Omega Loss-In-Weight feeder (Fig. 13) which, as its name implies, operates on the principle of control of loss-in-weight in the feeder hopper. This machine continuously "weighs out" material from a hopper that is carried on the scales. The rate of feed is determined by the rate that the poise is retracted on the scale beam by a mechanically driven lead screw. Any departure of the beam from exact balance position causes an immediate change in speed of the Rotolock feed mechanism, faster or slower, as required to maintain the scales in balance. The change in speed is affected effortlessly through the Omega wedge control device and the rotatrol mechanism that converts oscillating motion to progressive rotary motion. The Rotolock feeder cannot flood.

Guide No. VI— Select Accessories For Desired Operations

Practically every chemical feeder installation requires some accessories to satisfactorily accomplish the results required. Such accessories are used at the discretion of the engineer and should be selected on the basis of the actual requirements, making every effort to keep the chemical feeder installation as simple and free from gadgets as possible.

Some of the accessories available are bin level switches, pilot lights, belt shifters, rotary bin gates, remote controls, timers, special electrical starting equipment, control panels, mechanical miners, dust collectors, proportioning weir tanks, dissolvers, and

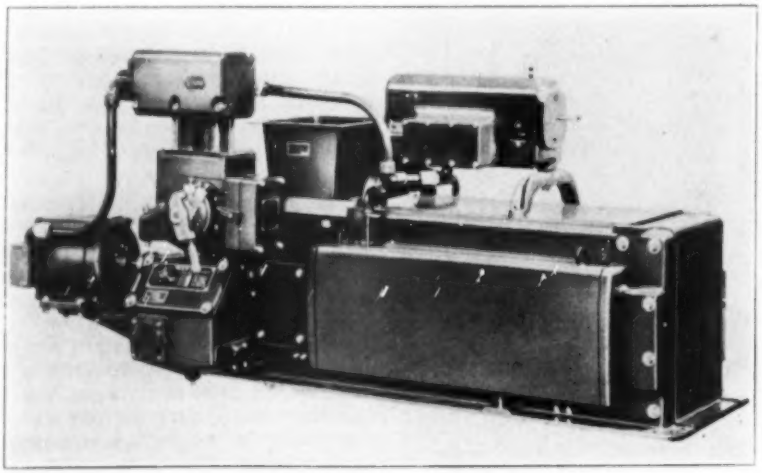


Fig. 11—W&T Merchen belt type gravimetric feeder

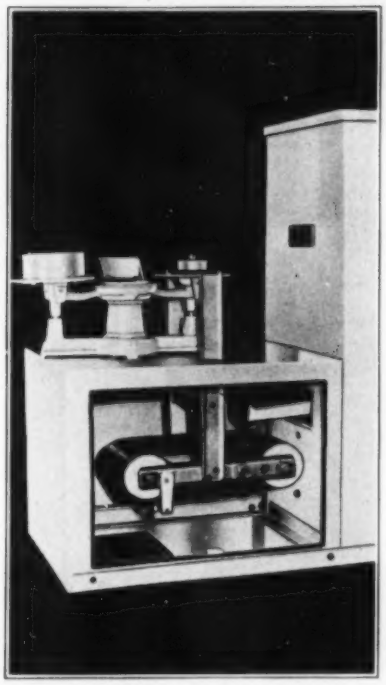


Fig. 12—SYNTRON gravimetric feeder
Belt type.

extension hoppers. Accessories such as totalizers, recorders and automatic alarm devices are available on gravimetric feeders only.

There are many other accessories which a chemical feeder manufacturer can usually offer to solve a particular problem.

Guide No. VII—
Furnish Information For Manufacturers

Information that will permit manufacturers to offer satisfactory equipment should include:

1. Chemical and physical properties of the chemical to be fed—name, formula, color, screen analysis, bulk density and any other chemical or physical data available.

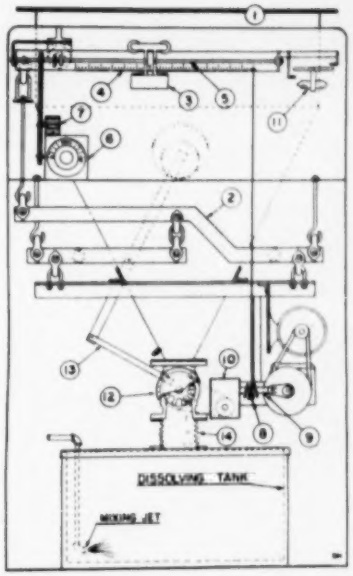
2. Type of feeder desired—volumetric or gravimetric, accuracy required (plus or minus 3 to 5 per cent by weight for volumetric feeders, or one per cent by weight for gravimetric feeders); dust removal units, types of controls and accessories desired.

3. Power available, voltage, phase, cycle and full information on special wiring codes, if any. State if compressed air is available and give full information as to water which will be used including temperature, pressure and hardness if possible. Be sure to mention any special chemical or physical properties of the water to be used.

4. General information—such items as sketches or drawings of space available, indicate bins, hoppers or other equipment existing or to be built which may affect the engineer's recommendations.

Guide No. VIII—
Evaluate Proposals

Give full consideration to these questions:



1. Hopper
2. Scale System
3. Poise
4. Scale Beam
5. Lead Screw
6. Lead Screw Drive
7. Totalizer
8. Wedge
9. Oscillator
10. Rotatrol
11. Alarm Switch
12. Rotolock Feeder
13. Agitator Levers
14. Flexible Connection

Fig. 13—OMEGA gravimetric feeder
Loss-In-Weight type.

1. Does the equipment meet the specifications?
2. Will it provide the performance desired?
3. What are the economics of the installation? Consider economics to be not only the first cost, but also cost of maintenance and service, length of life, and cost of operation.

Free-Flowing Fluorides for Lucky Lake Township*

To the surprise of citizens of Milwaukee County, a newly drilled water supply well just south of the Milwaukee City limits was found to produce water containing an ideal 1.1 parts per million of fluorine in the form of fluorides. This unexpected asset in the new well supply came at a time when the City of Milwaukee adopted artificial fluoridation of Lake Michigan water for the entire city and thousands of homes in surrounding suburbs. An exception was the Town of Lake, where the naturally fluoridized well came into use in July. Fluoride treatment of Milwaukee's water supply was started July 22nd.

There is no question about the fluoride content of the water. The State Department of Health made the tests, and is satisfied that a regular flow of water from the new well with a reasonable amount of fluoride is assured. There had been a water shortage in the suburban area of Milwaukee, and, as the Town of Lake expects to be annexed to the City of Milwaukee shortly, it was thought best to drill another well in the township, as no immediate additional supply of water from Milwaukee could be assured.

Layne-Northwest Co., water development specialists, drilled the new well, after an exploration with electric conductivity-resistivity tests in selecting the most promising locations. Six test wells were put down before the final location was established.

The new 38" well (26" inner casing) is 70' deep. Called a "gusher" it is reported to be the largest water producer in Milwaukee County, test-pumping 2,200 gpm with a drawdown of only 8 feet. For the present only 1,000 gpm is being pumped, with a drawdown of only 4 feet. An 8-hour test at 1,500 gpm with a drawdown of 6 feet was run recently. The static level of this well is 11 feet. Tests show that the water has a hardness of 30 grains; iron content 1.6 ppm.; sulphates 165 ppm and chlorides 267 ppm.

Other wells operated by the Town of Lake Water Utility are two, each being 1,800 feet deep. Recent tests have shown that these two wells produce water containing 0.6 ppm of fluorine as fluorides. No. 1 well produces 600 gpm and No. 2 about 400 gpm.

The hydrants of the City of Milwaukee are only a few hundred feet from the Town of Lake pumping station, but it is known that during peak load on the Milwaukee system pressure at these hydrants drops to only five pounds at times. The summer of 1953 was one of very low water pressure at outlying points on the Milwaukee system, necessitating restrictions on lawn sprinkling.

*Correspondent, John E. Hubel, Milwaukee, Wis.

1953 Conference of A.W.W.A. in Grand Rapids, Mich.

Concluding Report of Technical Sessions

THIS is our third and final report of the 73rd annual meeting of the American Water Works in Grand Rapids, Mich., May 10-15, 1953. The first report appeared in the July issue, and the second report in the August issue.

The following review covers three sessions of the Transmission and Distribution Division, two sessions of the Water Resources Division, a Joint Open Session (Committee Reports), and a General Session.

Transmission and Distribution Division Sessions

The Transmission and Distribution Division held three sessions. The first was devoted to reports of studies on that basic material—pipe.*

Cast-Iron Pipe Symposium

"THE NEW A.S.A. STANDARDS FOR CAST-IRON PIPE—A SYMPOSIUM."

Thomas H. Wiggin (Consulting Engr., New York, N.Y.) stated that Committee A-21 was organized in 1926, and was given funds by the producers to conduct tests on cast-iron pipe, particularly pressure tests. The producers later furnished additional funds to investigate the materials that go into pipe.

A sectional committee of 35 members was formed to write cast-iron pipe specifications for the American Standards Assn. There was hope that a mixture of metals could be found that would lessen corrosion. Only by adding a large amount of nickel was it found that corrosion could be stopped. An important branch of the committee was that assigned to develop specifications for coatings.

The coal-tar committee could not agree on specifications. The cement mortar committee finished its work, and the specifications for cement mortar lined pipe have been adopted. The thicknesses of the pipe are largely the same as for piping already in use. The specification thickness is based on using 5 ft. of cover. In laying water pipe, Mr. Wiggin stated that wooden blocks under pipe increases the breakage hazard. Tamping the soil around the bottom of the pipe is the better procedure.

J. T. VANN (American C.I. Pipe Co.) and H. W. STUART (U.S. Pipe & Foundry Co.) gave an account of the manufacturing considerations. The method of testing the bursting strength of the pipe also was described. Specification for cement mortar lined pipe (A21-4) has been approved. The specifications for fittings differ very little from previous specifications of the A.W.W.A. The phosphorous content of the cast-iron is limited to not more than 0.90 per cent, and the sulfur content is limited to not more than 0.10 per cent.

L. R. HOWSON (Alvord, Burdick & Howson, Chicago), in giving the Consulting Engineer's appraisal said we need specifications that define good material, and he believed this was accomplished in the present A.S.A. specifications A-21. The tests specified should be practical for the manufacturer. Cast-iron pipe has had a good record of service for nearly 150 years. The first A.W.W.A. specifications were adopted in 1908. He referred to the deficiency of linings for cast-iron pipe. The A.W.W.A. committee declined to approve the proposed coal-tar specifications.

WENDELL R. LADUE (Chief Engr. & Supt., Bureau of Water & Sewerage, Akron, O.) gave the manager's appraisal of the new specifications. He was of the opinion that there would be closer control of the manufacture of cast-iron. He also referred to limitation of the phosphorous to 0.9 per cent and the sulfur to 0.1 per cent.

Corrosion Mechanism

"MECHANISM OF THE INTERNAL CORROSION OF WATER PIPE" was reviewed in a paper prepared by James Lamb III, graduate student Research Asst., and Rolf Eliassen, Prof. of San. Eng., Mass. Inst. of Technology, Cambridge, Mass. Mr. Lamb presented the paper.

The corrosion of iron is universal. On the iron surface there are anodic areas in which the iron goes into solution, and cathodic areas where the iron is protected from solution by plating out of hydrogen ions on the metal surface or by depositing of the products of corrosion. In the use of metaphosphate glass for inhibiting corrosion, it was found that some of the phosphate was deposited in the cathodic areas. This was done by producing metaphosphate from radio active phosphorous and detecting the phosphorous on the iron surface with a Geiger counter. In replying to a question from the floor as to the concentration of metaphosphate solution used, Mr. Lamb stated that it was from 4 to 50 ppm.

J. Thompson Van
Am. C.I. Pipe Co.
Birmingham, Ala.

H. W. Stuart
Dir. Quality Control
U.S. Pipe & Foundry
Burlington, N.J.

Wendell R. LaDue
Ch. Engr. & Supt.
W. & S. Bureau
Akron, Ohio

Thomas H. Wiggin
Consulting Engr.
New York, N.Y.

Cast-Iron Pipe Symposium Speakers

Protective Coatings

"CAST-IRON PIPE COATINGS AS RELATED TO CORROSION" was the topic discussed by John R. Baylis, Supt. of Water & Sewers, Bureau of Water, Chicago, Ill., in the last paper on the program. He showed a number

*This session was reported by John R. Baylis, Supt. of Water & Sewers, Bureau of Water, Chicago, Ill.

of slides illustrating how corrosion with the formation of tubercles takes place. The velocity of the water has influence on the shape of the tubercles. Photographs were shown depicting the inside of a number of old pipes which had been in service from 30 to 100 years. All the pipes contained tubercles, however, the corrosion was not as extensive as that in pipes in many other cities. One interesting fact was that some of the pieces of pipe laid before the use of coal-tar coatings had very little corrosion and no tubercles were found that had been active within recent years.

A variety of papers comprised the second session of the Transmission and Distribution Division—motors,

Pipe Corrosion

James Lamb III
Research Asst.
Mass. Inst. of Tech.
Cambridge, Mass.

John R. Baylis
Supt. Water & Sewers
Bureau of Water
Chicago, Ill.

pumps, water pressure, and water hammer were subjects discussed.*

Pump Motor Details

"Motor Drives for Water Pumping" was the title of a paper by E. O. Potthoff, and M. C. Boggis, application engineers, Ind. Engr. Div., General Electric Co., Schenectady, N. Y., who described various details of types of motor drives and their selection. Data presented in the paper were confined to motors in the 700, 900 and 1200 rpm classes.

Mr. Potthoff opened with the statement that there are two selection criteria: (1) The type of drive (squirrel cage or synchronous), and (2) features of the drive (drip-proof, totally enclosed, voltage, etc.).

In selecting the type of drive there are three objectives to consider: Low cost, suitable performance characteristics, and simplicity and ruggedness of construction. Types of motor drives include constant speed and adjustable speed drives; the former usually are less costly.

Constant speed drives includes squirrel cage, synchronous and wound

Programmers

Motor Drives
E. O. Potthoff
Applic. Engr.
Genl. Elec. Co.
Schenectady, N.Y.

Vertical Pumps
Thomas M. Niles
Partner
Greely & Hansen
Chicago, Ill.

Automatic Controls
J. S. Williams
Automatic Control Co.
St. Paul, Minn.

Lewis S. Finch
V.P. & Chief Engr.
Indpls. Water Co.
Indianapolis, Ind.

rotor motors. The first is lower in original cost and maintenance; the second more complex but cheaper to operate, except for higher maintenance; and the third, while more complicated than a squirrel cage, uses less power for starting. To illustrate the comparative costs versus motor efficiency and horse power the speaker used slides. Adjustable speed drives are used to obtain flexibility and the wound rotor induction motor is best, but usually costs twice as much as a single motor.

As to types of motor controls, Mr. Potthoff mentioned cams, magnetic controls and liquid rheostats. As to type of motor enclosure the speaker listed four: open, drip-proof, splash-proof and totally enclosed. The latter two should never be considered for indoor locations.

Slides were presented to show the relation of voltage used to cost for the different types of motors. A point of selection break occurs at about 175 to 250 volts. There is, however, no simple formula for the selection of motor drives; each case needs careful engineering study.

In answer to a question by Malcolm Pirnie, Jr., Cons. Engr., New York City, the speaker said that for intermittent operation there is no need for a small voltage heating current on totally enclosed motors, but there should be such provision on open motors. Also, in answer to a question, the speaker stated that the nominal voltage of a motor could be exceeded by 10 per cent without harm.

Vertical Pump Considerations

"Application of Vertical Pumps to Water Works Practice" was the title of a paper by Thomas M. Niles, Partner, Greeley & Hansen, Engrs., Chicago, Ill.

A survey of pump installations has disclosed that there are far more horizontal double suction pumps than vertical end suction pumps employed where the pumping capacity is below 14 mgd. While small capacities for low heads are not available in vertical pumps, high head and large capacity are available in these pumps.

Vertical pumps can be installed in small space. They can be placed at low elevations with shafts to motors above. This permits self-priming. While vertical pumps cost more than horizontal, the cost spread is decreasing, and the overall installation cost favors vertical pumps since the size of the pumping station required for vertical pumps is less than that for horizontal pumps. The efficiency of the two types of pumps is about the same but maintenance is easier on vertical pumps. There is, however, the need for heavier shafts and thrust bearings to offset the problem of shaft deflection in vertical pumps.

Mr. Niles showed slides to illustrate capacity versus type installations and the relative arrangements for the different types. He also stated that, at the present time, the largest pump installations are of the vertical end suction type. He cited three recent installations of 130, 500 and 970 mgd and the new 1040 mgd (at 240 ft. head) vertical pumps at Grand Coulee, as well as the new vertical pump installations at Niagara Falls, N. Y., and the Dalecarlia Plant in Washington, D. C.

While vertical pumps have not yet been used for installations under 14 mgd at 60 ft. head, Mr. Niles expects the vertical pump to come more and more into the water works picture.

Automatic Controls

"Control of Water Pressure on Suburban Distribution Lines" was reviewed by J. S. Williams, Automatic Control Co., St. Paul, Minn., who used lantern slides as illustrations. The speaker pointed out that there are three methods by which water pressures in suburban areas can be maintained by boosted pressure; these are elevated storage, hydro-pneumatic storage and the closed system.

*This session was reported by George E. Symons, Consultant and Technical Editor, Larchmont, N.Y.

Max Socha
Head, W.W. Div.
Water & Power Dept.
Los Angeles, Calif.

Plastic Service Pipe Panel

J. G. Carns, Jr.
Eng. Dept.
Am. W.W. Service Co.
Philadelphia, Pa.

W. D. Tiedeman
Exec. Director
Natl. San. Found.
Ann Arbor, Mich.

In elevated storage tank systems, pump engineers think in terms of TDH, but control engineers are concerned with the water used en route and static and dynamic conditions. Starting a pump seldom presents a problem to the control engineer; mostly he deals with a relatively stable condition, except for pressure fluctuation due to surges which are compensated for within the control. Control engineers also are not concerned with friction losses which are constant, but friction losses which vary are important.

Elevated storage has many advantages particularly where multi-pump controls are used, but hydropneumatic tanks are not suited to pressure control of peripheral distribution because they lack reserve for power outage and are completely dependent on the pumping source.

In a closed system two fundamentals are flow and pressure which must be considered together; while flow varies over a wide range, pressure variations are undesirable and the problem of the control engineer is to supply demand while maintaining pressure.

For this problem the selection of pumps is important; it is more than consideration of gpm, head and efficiency. The characteristic curve of the pump is important whether the control is automatic or manual. For elevated tanks, pump curves should have steep characteristics; for a closed system the pump should have a flat characteristic curve.

In a closed system, pump operation may be in sequence or programmed. In sequence operation the lead pump should have a nominal rating of approximately minimum demand and multiples of pumps of equal rated capacity and identical characteristics are used. The system friction curve is important and "low" and "high" pressure limits are set for cutting in or out the pumps in sequence.

In programmed operation the lead pump is selected to meet minimum demand and other pumps of different capacity are selected to meet all requirements. Wear on the pumps is equalized by rotation. When a small pump is dropped out for a larger one, there must be an overlap until new pump has picked up full load. This timing is determined from observation of pressure gauge.

In some cases the pressure of the main system may be sufficient (particularly at night) to supply the suburban area without use of the booster station, in which case the control measures the pressure on the booster pump suction and operates from that pressure. The closed system also can be operated in conjunction with elevated storage. In this case a check valve is added to the main supply line to the tank so water can flow from but not into the tank by that route. A bypass with motorized valve is installed around the check valve, and this motorized valve is controlled by a sensing unit which measures actual tank level; when the level falls, water enters the tank through the bypass and fills the tank at the same time as water from the booster pump goes to the distribution system. This is the only method by which an elevated tank can be used in connection with a closed system.

In discussing the paper, L. S. FINCH, Vice Pres. and Chief Engr., Indianapolis Water Co., Indianapolis, Ind., said that automatic controls are not fool-proof; they do require a minimum amount of attention. According to Mr. Finch, there are some conditions where control doesn't operate in remote areas, and in such cases it is better to use elevated storage.

On the matter of small bypasses around pump in booster stations Mr. Finch recommended a bypass for each pump; not just the lead pump as indicated by Mr. Williams. One note of caution, "Don't place complete dependence on automatic controls to end fluctuations and surge." Mr. Finch suggests some supervisory control from a central station, and a signal system to the central station to show pressures in the booster area and to indicate power failure, stand-by power operation and other conditions which might arise.

Water Hammer Tests

"COMMITTEE PROGRESS REPORT ON WATER HAMMER" was presented by Hugh Kennison, Chief Engr., Lock Joint Pipe Co., East Orange, N. J.

The report covered surge wave studies on reinforced concrete pressure pipe at Louisville, Ky., Denver, Colo. and Hartford, Conn. Mr. Kennison said that more tests were needed and that it is difficult to obtain approval for tests especially where water supply is short. Among the requirements for a test, the speaker gave these: a 10,000 ft. section of pipe, no cross connections, operation at 15 psi, low velocity, and a specific discharge valve closing time. The test can be made in one hour. The committee needs tests on steel cylinder concrete pipe and also wants more reinforced concrete pipe studies.

Lake Fluctuations

John E. Vogt
San. Engr.
Water Supply Section
State Health Dept.
Lansing, Mich.

Donald M. Pierce
Chief
Sewerage Section
State Health Dept.
Lansing, Mich.

The third session of the Transmission and Distribution Division included a panel discussion on plastic service pipe, and a report on the new North Jersey District water supply line.

Plastic Service Pipe

MAX SOCHA, Head, Water Supply Div., Los Angeles Dept. of Water & Power, was the first speaker in a panel discussion of plastic pipe and tubing for domestic water service lines. He reported on studies of several types of plastic pipe and tubing including those of cellulose acetate butrate, polyethylene and three types of rigid polyvinyl chloride.

The 1" pipe of cellulose acetate butrate had the disadvantage of becoming very soft at 140° F and therefore would not stand the backing up of hot water from home heaters. All of the butrate plastics tested imparted a taste and odor to the water standing in the line. After one year in service under 160 psi pressure the pipe

seemed to have lost its elasticity, became brittle and split upon applying the 700 psi test pressure which it withstood when installed. It was not considered suitable for Los Angeles conditions with pressure variations from 40 to 250 psi.

The polyethylene test specimens of flexible tubing and rigid pipe both imparted a slight taste or odor to water standing in the lines. The rigid pipe is too brittle to be a practical service line material. The flexible polyethylene tubing showed that slow flow and distortion occurred under pressures above 100 psi and ultimately failed. It was not considered adaptable to the variety of pressure on the Los Angeles system but for low pressures should prove meritorious and economical.

Water Resources

Burton S. Grant
Ch. Engr. & Asst. Mgr.
Water & Power Dept.
Los Angeles, Calif.

Herbert E. Hudson
Head, Eng. Subdiv.
State Water Survey
Urbana, Ill.

The rigid polyvinyl chloride pipe is available in three types. Types 1 and 2 were ruled out because of cost being in excess of copper tubing, brittleness, etc. Type 3 imparted a taste of linseed oil. It costs less than copper tubing but jointing with flared fittings and a special cement detracts. The taste problem may be eliminated by the manufacturers now working on it.

JAS. G. CARNS, and MARTIN E. FLENTJE, engineer and chief chemist, respectively of the Am. Water Works Service Co., Philadelphia, reported experiences with the polyethylene type of flexible plastic tubing for service lines over a three year period at a number of plants throughout the country. [These experiences were reported in an article by Messrs. Carns and Flentje in the Nov. 1952 issue of *Water & Sewage Works*, to which the reader should refer.—Ed.]

The presentation at the convention brought these experiences up to date. It was pointed out that the services in no case were under more than 100 psi pressures. One important contribution is the method of connecting the plastic tubing to main and meter with brass adaptors developed especially for plastic tubing. (More adaptors are described and pictured in the November 1952 article referred to.—Ed.) Until the adaptors were put to use difficulties had been experienced with the plastic adaptors. No complaints have been recorded in respect to effect of the polyethylene plastic on palatability of the water. With 1200 installations spread over 111 systems experience indicates that the polyethylene tubing now on the market for water supply service is satisfactory, whereas standardization and further improvement is being sought by the manufacturers.

Dale Maffitt
Genl. Mgr.
Water Works Bd.
Des Moines, Iowa

Water Resources Programmers

N. T. Veatch
Partner
Black & Veatch
Kansas City, Mo.

Louis R. Howson
Alvord, Burdick & Howson
Chicago, Ill.

WALTER D. TIEDEMAN, Exec. Director, Testing Labs., Nat'l. Sanitation Foundation Inc., Univ. of Michigan, recounted plans of the Nat'l. Sanitation Foundation Testing Laboratory to test the various forms of plastic pipe and tubing as to relative fitness for water supply service. The work is being conducted under sponsorship of the Society of the Plastics Industry Inc., and the guidance of a committee composed of state sanitary engineers, a representative of A.W.W.A. and technical representatives from the plastic industry. Twenty-eight samples of plastic pipe and tubing will be tested for toxicity, taste or odor effects, effects of various soils and waters on the several types of plastic, etc. It is hoped that procedure will be evolved whereby the water works now can specify and identify the types of plastic most suitable for water service lines. No information is to be released until the studies have reached completion.

North Jersey's New Supply Line

CHAS. A. CAPEN, Chief Engr., North Jersey Distr. Water Supply Comm. and A.W.W.A. president gave an illustrated description of the new Ramapo force main, installed to supplement the Wanaque Reservoir supply by 25 mgd. when required to meet dry weather deficiencies. The auxiliary supply will be pumped from the Ramapo River up to the reservoir through 72" steel pipe with wall thickness of 7/16" operating under an 80 ft. head. Pipe lengths were 40 ft. and jointed by welding.

Water Resources Division Sessions

The Water Resources Division held two sessions, the first being devoted to various aspects of flood control.

Missouri River Projects

DALE MAFFITT, Genl. Mgr., Des Moines (Ia.) Water Works and vice-president of A.W.W.A. reviewed the history and current developments involving control of the Missouri River by a series of dams in the proposed $11,000,000,000 Missouri Valley Authority. The Fort Peck Dam in Wyoming comprises the first unit in the several plans proposed. Studies and surveys made by the Army Corps of Engr. and the U.S. Bureau of Reclamation from 1929 resulted in overlapping of interests and conflict, the outgrowth of which was the Peck-Sloan Plan with which your engineers agree. The governors of the 10 states affected formed a Committee. In 1945 an Inter-Agency Committee was established and the 10 state governors became members. A six year plan was developed by this committee.

The Hoover Committee reported to President Truman that the proposed Mo. Valley Authority would not be the proper solution. The President's Temporary Nat'l. Water Policy Commission advocated to President Truman the establishment of River Basin Commissions as the solution to river control problems. The Water Panel and Special Task Force of the Engrs. Joint Council made an independent report and recommendation of a Nat'l. Water Policy. Upon appearance of the President's Nat'l. Water Policy Commission, the E.J.C. Panel published its objections to the socialistic recommendations of the President's Commission. E.J.C.'s "Principles of Sound Policy" was published and widely distributed. As late as Feb. 20, 1953 the Mo. Valley Com-

F. G. Gordon
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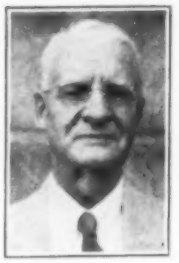
H. Arthur Price
Specif. Engr.
Water & Power Dept.
Los Angeles, Calif.



H. O. Hill
Asst. Chief Engr.
Bethlehem Steel Co.
Bethlehem, Pa.

Water Works Practice Committee Reports

mittee recommended a 10 man commission and proposed an Interstate-Federal Compact which represents a new type of regional organization. However, President Eisenhower has refused to make any commitments regarding the proposed Missouri Valley Compact, and there the matter stands.

Kansas Rivers Control

N. T. VEATCH, Cons. Engr., Kansas City, Mo., represented the special three man engineering board of Abel Wolman, L. R. Howson and himself which had been retained by the Kansas State Chamber of Commerce, at the instance of the Governor, to analyze and evaluate the several confounding and conflicting reports from three Federal agencies on the matter of controlling floods along Kansas' two principal rivers. The corps of Engrs. plan involves 34 to 36 reservoirs at a cost of $700,000,000. The Dept. of Agriculture plan, known as "land treatment" requires 20 years to complete at cost of $94,000,000.

The Veatch - Howson - Wolman Board of independent engineers conclude that neither plan can be justified either on a cost or performance basis. Since the 1903 and 1951 Kansas Floods created major damages, $478,000,000 to Kansas City proper; it is the Board's conclusion that maximum protection for least expenditure calls for no upstream control but an effective channelization of the Kansas and Kaw Rivers through Kansas City, supplemented by dykes or levies at a cost of $200,000,000 with Federal participation.

L. R. HOWSON stressed the practical aspect of flood control, involving a flood at about 50 yr. intervals such as the history of Kansas City floods had been. The Board feels that it is realistic to provide a 76% damage prevention through expenditure of $200,000,000 which is but 25% of the cost of providing the 34 upstream dams advocated by the Corps of Engineers to cost $700,000,000. Aside from original cost, the serious question is how would the 34 or 36 dams be operated to assure flood control.

[This reporter having seen the river valley with 4 to 5 ft. of fine sand and silt deposited over it by the flood, it was interesting to learn that even the 1951 flood proved the farmer's blessing in disguise. Deep plowing (really deep plowing) had brought to the surface the highly productive loam with the result that the lush 1952 crops had more than paid the cost of land recovery, without recourse to fertilization for bountiful yields. Furthermore, it would tax our imagination to believe that the 34 reservoirs over the countryside would long remain "dry holes" to check infrequent floods. The populace would soon see to it that these reservoirs become the recreation spots for boating, swimming and fishing that Kansans could enjoy.—Ed.]

Predicting Lake Fluctuations

JOHN E. VOGT, San. Engr., Mich. State Dept. of Health, presented the findings of himself and associate DONALD M. PIERCE, who jointly had made a study of the fluctuations of water levels in the Huron-Michigan Lake system which permit advance predictions of trends in lake levels over a period of years.

We will make no attempt to describe the involved statistical study of recorded lake levels covering 91 years. Some of the conclusions reached are the following:

(1) There is a 50-50 chance that the difference between the lowest and highest monthly mean water elevation in any single year will not exceed 1.25 ft.

(2) With 95% certainty the difference in levels will not exceed 2.0 ft. nor be less than 0.4 ft.

(3) In actual elevations it can be predicted with 95% certainty that the high monthly mean elevation will not exceed 583.5 ft. and with 50% certainty that it will not exceed 581.2 ft.

(4) With 95% certainty it can be predicted that the low monthly mean in a given year will not be lower than 577.7 ft.

Surprisingly, no correlation could be found between rainfall records and lake levels. A test of the predictions in 1952 revealed an actual maximum monthly near lake elevation of 582.7 whereas the statistical method had predicted an elevation of 582.77 ft.

The second session of the Water Resources Division included papers devoted largely to water pollution control and conservation measures.*

Underground Pollution

"GROUND WATER POLLUTION CONTROL—COMMITTEE REPORT." This report was presented by N. F. Billings, Hydrogeologist, State Water Resources Commission, Lansing, Mich. The committee has found that the problem of ground water pollution is nation-wide, with varying types of wastes contributing.

Rates of seepage are low and tend to be persistent, but horizontal flow is laminar and smooth. If dilution is not extensive, the route taken by a pollutant is difficult to predict. Wells have a direct effect on the underground flow.

Industrial expansion probably will continue; if so, it not only will increase local water requirements, but will produce a corresponding increase in waste. In many cases, small amounts of wastes are noticeable in and detrimental to a groundwater supply.

The committee concludes that a potential ground water pollution hazard exists wherever industrial expansion occurs and the trend to underground waste disposal exists. Enforcement agencies cannot wait until pollution occurs. In its recommendations, the committee stated that locations where underground pollution is impossible should be located, industry should notify authorities when wastes exist on its own initiative. It was also suggested that the agency receiving knowledge of waste into or onto the ground should judge the reasonableness and issue permits for disposal of specific wastes. Industry should have recourse to the courts for review of the facts.

Discussion of the ground water pollution problem revealed interest in establishment of more regulating authorities, and also specific examples of ground water pollution resulting from oil processing wastes, gas house wastes, brine intrusion from leaking gas well casings, and from insecticide manufacturing.

Reservoir Erosion

"EROSION CONTROL ON RESERVOIR AREAS—COMMITTEE REPORT," was presented by B. S. Grant, Chief Engr. of Water Works, Los Angeles, Calif. Population increases on watershed areas have had a marked effect on erosion, due to clearing of wooded

*This session was reported by V. W. Langworthy, Research Chemist, The Chlorine Institute, Inc., New York, N.Y.

areas and road building. Knowledge gained in the last three decades has enabled an increase in reservoir capacity due to soil and forest conservation.

The waterworks industry is lagging in erosion control work, but has received benefits from the work of other agencies. This is because the reservoir is usually at the end of a chain of events in which upstream and watershed protection has taken precedence. Water utilities in the Western United States cooperatively control logging and other activities.

The committee concludes and recommends that advancements in ecology should be recognized by the water works industry and that management should take part in all phases of watershed protection. Legislation at federal, state and local levels is in effect and should be made effective. The existence and extent of erosion problems should be investigated and a solution sought for existing problems.

An example was cited of a bark beetle infestation which had a degrading effect on watersheds in Colorado. Dead trees reduced the volume of snow deposit, allowing 25 per cent more water to reach the ground. Thawing resulted in more and faster run-off to streams in the watershed early in the season, and reduced later run-offs. Such a situation dictates the use of more and larger reservoirs to insure an adequate water supply.

Water Conservation

"Water Conservation Methods Used in Industry," were described by H. E. Hudson, Head Engr., State Water Survey, Urbana, Ill. This was a task group report which included a literature review of value in the study of water conservation in industry. It is expected that industrial use of water will amount to 215 billion gallons per day by 1975.

The task group reported upon the techniques commonly used in industry to conserve water: 1. Control of water use; 2. Recycling (of cooling water, for example); 3. Multiple use (use of water for more than one process); and 4. Substitution (use of salt water for cooling).

Well Pumping Data

"Interpretation of Pumping Test Data for Wells," were the subject of a paper by R. H. Brown, Acting Chief, Ground Water Hydraulics Section, U.S. Geologic Survey, Washington, D.C.

Mr. Brown made extensive use of slides to illustrate a very difficult procedure. The slides revealed aquifer details and explained the functions of underground storage.

Data obtained from test wells pumping under stabilized conditions are plotted. The type of curve resulting will reveal to an experienced observer the coefficients of transmissibility and storage for a given aquifer. Such studies assist in well spacing, adding new wells, pumping rates and pumping schedules. They also contribute greatly to an appraisal of ground water resources in an area.

W. A. Kunigk
Supt., Water Div.
Public Utilities Dept.
Tacoma, Wash.

A. A. Ulrich
Mgr., Massillon Dist.
Ohio Water Service
Massillon, Ohio

M. P. Hatcher
Director
Water Dept.
Kansas City, Mo.

Water Works Administration Committee Reports

Correlating Committees Report

A Joint Open Session was devoted to the reports of two Correlating Committees.

Water Works Practice

Chairman Howson, presiding over the open session of the Water Works Practice Committee, reported that his Committee is working on 42 classifications. Fourteen specifications are now ready for permanent status after a year's test as "Tentative Standards."

Some of the projected studies to be taken up by the committee include a study of effects of temperature changes on main breaks; specifications for coal-tar pipe linings will be developed; effects of water treatment on main deterioration and loss of capacity are to be investigated; equipment and methods of measuring water hammer will be evaluated; specifications for butterfly type valves are needed, since these valves possess several advantages for the larger mains.

Several members recited experiences with butterfly type valves.

E. A. Schmitt, Chief Engr. of Water Supply Div., Washington, D.C., reported adoption of butterfly valves for new transmission lines.

W. A. Kunigk, Supt. and Engr., Water Div., Tacoma, Wash., had nothing but good to say for butterfly type valves which Tacoma uses to control the hydraulic gradient on the supply line. He reported that these 24 inch valves, with bronze discs and seats, would shut practically tight against 250 lbs. pressure. The disc, he said, closes at an angle of 12° from horizontal.

F. G. Gordon, Chief Design Engr., Dept. Water & Sewage, Chicago, reported on a 24 in. butterfly valve installed on a Chicago filter which has operated 24,000 times in 11 months and was still closing tight and in excellent condition.

Cement Pipe Linings

Arthur H. Price, Specifications Engr., Dept. of Water, Los Angeles, as chairman of the sub-committee on cement lining of pipe reported that pipe lined in place could be lined with remarkable uniformity. As to thickness of lining, the committee believes 3/16" linings are too thin and recommends ¼" for pipe of 12 to 32 in. diameter; ⅜" for 32 to 48 in. pipe; ½" for all larger pipe. Specifications for spun linings are to be revised.

Thos. H. Wiggin, Cons. Engr., New York, in reporting on his experiences stated that he had used some 3/16" lined pipe. No rust showed through but the lining became chalky. The qualtity of cement used is a factor exceeding lining thickness in importance. The quality of the water is another equally important factor. For the less corrosive waters a 3/16" lining on 24 and 30 in. pipe had been satisfactory; whereas, in connection with a more aggressive water a ½" lining became chalky and became loose in the pipe. Cast iron pipe manufacturers at first used a mortar of 3 parts cement to 1 part sand but more recently use 1 part cement to 1½ parts sand.

W. R. LaDue, Supt. and Chief Engr., Dept. Water & Sewage, Akron, Ohio, reported on 15,000 ft. of steel transmission line laid in place some 14 years ago. Although some parts of the pipe were badly pitted, a lining of ⅜" to 9/16" had been thoroughly satisfactory over the 14 years under head of 40 to 90 lbs. Actually, experimental work had revealed that holes of 1½" diameter had been bridged

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Gainesville, Fla.

Edw. R. Stapely
Dean
Okla. Inst. of Tech.
Stillwater, Okla.

Water Works Personnel Training

with the lining and had not given way under test pressures up to 200 lbs. Specs. for the lining mortar (machine applied) called for 5 to 7% natural cement.

Tank Coatings

H. O. Hill, Asst. Chief. Engr., Bethlehem Steel Co., reporting for the committee on metallic coatings for tanks stated that it was the consensus of the committee that the metallizing of tank interiors to be worthy of more study.

Arthur Price, reported on experience with a steel tank on the Los Angeles system protected with a three coat Vinyl plastic application which after 10 years showed but one or two small rust spots.

Lewis Finch reported that all of the test strips of plastic coatings in Indianapolis had stood up better than other coatings.

Water Works Administration

Chairman LaDue opened the session of the Water Works Administration Committee by describing the work of his sub-committee group which is to take up model "Rules and Regulations" and the development of "Minimum Standards" in water works operation and maintenance.

Radio in Water Works

M. B. Cunningham, Supt., Water & Sewage, Oklahoma City, Okla., reported that at least 100 water departments have added mobile radio units during the year.

W. A. Kunigk, reported on Tacoma's experience with mobile radio and in particular on the proven worth of radio reporting immediately following the earthquake. In 20 minutes he knew the condition of the Tacoma supply mains and could devote attention to the distribution system in rapid order.

M. P. Hatcher, Kansas City's Director of Water said that they had learned the hard way what value mobile radio would have had in his operations during the flood. On order at the time, one month later he had it.

Fire Prevention & Protection

A. A. Ulrich, Mgr., Ohio Water Service Co., Massilon, Ohio, reported as the new chairman of this subcommittee, which expects to have a report within the year.

Accounting Practices

J. J. Barr, Vice-Pres., Water Utilities Service Corp., Philadelphia, reporting for the coordinating committee stated that his group is working with the NARUC on modernization of accounting systems. Straight line depreciation will have to be continued except in cases where state corporation or utilities commissions permit other systems. A pattern of accounting for use by the smaller systems is to be simplified.

Water Use

H. E. Hudson, Head, Eng. Div., State Water Survey, Urbana, Ill., stated that his committee's report, soon to be released, would provide tables indicating the volume of water used per unit of production by various industrial water users. Suggestions of procedure and measures for advancing water conservation are incorporated. Methods applicable to wasteful industrial water users will be included in the report.

General Session

One General Session was held during the Conference to present a paper, a panel discussion, and a task group report of wide general interest.*

Highways vs. Utilities

"The Highway Improvement Problem—Panel Discussion."

Harry E. Jordan, as panel chairman, in introducing the subject of the cost of utility changes due to highway improvements, stated that highway commissions generally have the concept that highways are for travel use and that utilities are located there by sufferance only.

Alfred O. Norris, Indianapolis Water Co., stated that railroads usually are not required to stand the cost of their changes except in the case of grade crossing eliminations. Railroads, however, are located on private rights of way instead of public, as is the case with municipal utilities. No reimbursement can be expected covering the customary improvements in service when changes are made.

John M. Jester, Washington Suburban Sanitary District, quoted costs on five projects totaling $6,500,000, in which the Washington Suburban Sanitary District was involved where the cost of utility changes ranged from 1.2 to 7.7 per cent. On three of these projects involving nearly five and one-half million dollars, the cost of utility changes was less than three per cent.

John W. Cramer reported that in Nebraska the cost of utility changes had not been excessive, usually three to four per cent of the total cost of the projects. He pointed out that private electric and telephone companies have sometimes been subjected to similar costs by cities.

In the discussion, it was brought out that the practice of reimbursement varies from state to state and possibly even in the same state. New York state was reported as reimbursing for amounts equivalent to depreciation. Many states, before permitting location of utilities in highway rights of way, require signing of a dispossess notice requiring moving of utilities at any time.

The most important argument in favor of reimbursement to water departments of cost of utility changes would seem to be that whereas the per cent of such cost is small compared to the total cost of the highway improvement, yet such costs may be a large proportion of the total water department budget.

Industrial Problems

"Problems of Industrial Mobilization and Demobilization" were discussed by Harvey S. Howe, Lock Joint Pipe Company.

The controlled materials plan of World War II proved to be not only simple but also efficient and adequate. The water situation is always particularly difficult because the importance of water and the seriousness of a shortage are not properly appreciated by the public.

A great deal of valuable statistical information was collected during

*This session was reported by Edward R. Stapely, Dean, Oklahoma Institute of Technology, Agr. and Mech. College, Stillwater, Okla.

World War II. Little or none was available at the start.

A small agency, manned by experienced water works men, is needed to handle the needs of water departments for critical materials. Several men from industry should be trained in peace time—in order to be available as a pool in emergencies.

Personnel Training

"TRAINING WATER WORKS PERSONNEL THROUGH SCHOOLS AND CONFERENCES," a report of Task Group G-16, was prepared by Raymond J. Faust, Chairman, and members Edward S. Hopkins, Fred Merryfield, A. P. Black, Edward R. Stapely.

The present status of short courses, conferences, and regular college credit courses available to water works men in the different states was reported. Several states do not offer short courses or special conferences. College courses of particular application to the water works field are provided in relatively few institutions.

Highway Improvement Problems

A. O. Norris
Exec. Vice-Pres.
Indpls. Water Co.
Indianapolis, Ind.

John M. Jester
Engr., Maint. Div.
Wash. Sub. San Comm.
Hyattsville, Md.

Twenty-three states have now adopted certification of water works personnel. Sixteen of these are on a voluntary basis with seven on a compulsory or statutory plan. Examinations, usually written, are required in all but one of these states. Any type of certification improves the situation, but the compulsory type is much more effective.

Recommendations made by the Task Group included:

1. Encouraging the raising of the general level of educational requirements of job applicants for water works employment and the upgrading of those already employed.

2. A study of job classifications, educational requirements for each, the suggestion of suitable courses, and the preparation of outlines of subject matter to be covered.

3. Certification by examination on a uniform and permanent basis under general administration of State Departments of Health.

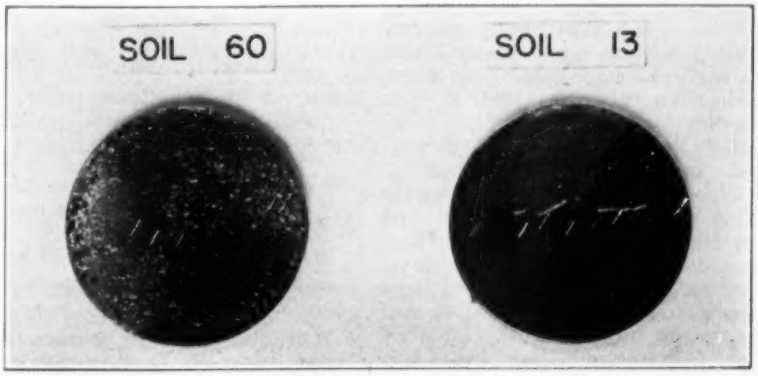
Corrosion Rate of Steel in Soil Can Be Measured Electrically

A recent laboratory study by the National Bureau of Standards proves for the first time that the rate of weight loss of a piece of steel corroding normally in soil can be measured electrically, without actually weighing the metal. Although the NBS measurements were restricted to the laboratory, the success of the work suggests the possibility of valuable practical applications, such as determination of the corrosion rate of a tank or other underground structure without the need for visual inspection.

When iron or steel is exposed to the soil, local differences in electrical potential develop at the surface of the metal, resulting in the formation of numerous small corrosion cells. This means that electric currents flow through the soil from certain areas (anodes) to areas of less negative potential (cathodes), with accompanying discharge of hydrogen ions at the cathodes and loss of metal from the anodes. By Faraday's law, the rate of weight loss from corrosion is proportional to the current. The study demonstrates for the first time that the total corrosion current (and thus the weight loss) of metals corroding in soils can be determined from an equation based on the changes in slope of cathodic and anodic polarization curves.

In establishing the feasibility of the indirect measuring technique, weighed steel specimens, differentially aerated, were exposed at the Bureau to five corrosive soils for approximately two months. The soils ranged in reaction from very acid (pH 2.9) to very alkaline (pH 9.6). Because of the possibility of changes in rates of corrosion during the two-month period, polarization curves were obtained at intervals throughout the exposure period. At the end of this period the specimens were removed from the soils, cleaned, and reweighed. Actual weight losses were compared with weight losses calculated indirectly by Faraday's law.

For field determination of underground corrosion the electrical method, if it proves practicable in the field as well as the laboratory, would have several advantages in addition to obviating the need for excavating the underground object. Although in some soils ferrous metals corrode at a constant rate year after year, in other soils corrosion gradually slows down and in time may virtually cease. Actual weighing or inspection of an object that has been buried for years will indicate how much total corrosion has occurred, but will not show how rapidly, if at all, it has been corroding just prior to inspection. The electrical method, on the other hand, measures the present corrosion rate, which is likely to be of greater practical interest than the history of past corrosion. Furthermore, the electrical method does not involve the removal of corrosion products, which often inhibit corrosion.



STEEL specimens after 2 months exposure to soil corrosion

Specimen on the left was exposed to acid soil (pH 2.9) and that on the right to alkaline soil (pH 9.5).

THE "CUT-UP"—our name for the barge, here carrying a six-ton load.

Removing Floating Islands in Charleston Reservoir

by **F. B. McDOWELL,** ***Manager and Engineer, Dept. of Public Works, Charleston, S.C.***

THE average waterworks man might be somewhat incredulous at the sight of floating islands in a water impounding reservoir.

A large piece of "land" with bushes and maybe a tree or two on it moving around in Goose Creek Reservoir at Charleston, S.C., wouldn't startle employes at the Hanahan Pumping Station—they know all about floating islands. They have been busily occupied in removing the islands which now cover a large part of the reservoir. The means of removal is a floating contrivance which was developed principally by C. G. Shipley, pumping station superintendent.

The floating islands consist mainly of a heavy mat of tangled roots of aquatic and semi-quatic vegetation and rice-field muck. The muck is mostly matter which separated from virgin soil and rose to the surface as old rice fields were flooded when the Goose Creek Dam was constructed in 1904. The resulting islands are from 18 to 24 inches thick, and are by no means solid, but they give enough support for willows to grow. Some of the trees have trunks measuring from two to six inches in diameter.

Normally, the islands remain in one spot because roots have grown down to the bottom of the reservoir, but in times of heavy rains and consequent rises in the lake level, the islands float and pull loose. When the wind blows the islands move around because trees and bushes on them act as sails. Here is where the chief danger occurs. The islands, following the constant current to the spillway, could jam up this outlet, causing water in the reservoir to rise still higher. Such a rise could damage the retaining walls.

Another danger is that the vegetation of which the islands are composed is constantly decaying and adding unwanted organic matter to the water. Goose Creek Reservoir is now on a stand-by basis, although West Virginia Pulp and Paper Company takes part of its supply from the reservoir. Hence, the concern for its upkeep.

A preliminary report on this topic appeared in "Out of the Spigot," a publication of the South Carolina Water and Sewage Works Assn., It has been revised by the author for publication in *Water & Sewage Works.*

The Barge

The floating machinery used to remove the islands consists of two lighters five feet wide and 15 feet long, held together by a steel beam and crosspieces on the decks. The 8 ft.-5 in. space between the lighters contains a steel pan which has three sides and is open to the front. This pan may be raised and lowered by means of a winch and chainfall.

The barge is powered by a 25 horsepower outboard motor. It is run up to a floating island and two

20-foot pipes at the stern are lowered through the lighters, firmly anchoring them. Then the pan is lowered 18 inches below the surface of the water. A catwalk plank frame, which is raised by block and tackle while the craft is underway, is then lowered to form the support for workmen. This frame has a crosspiece and forms a walkway enclosing an area some 15 feet square.

Workmen with saws then go out on the catwalk, sawing through the island as they go. Then, like a cake, they slice it into sections, and other workmen on the barge use two-pronged "hoes" to pull the sections of the island into the pan. The pan, which can hold up to six tons, is then raised and the load carried to disposal areas.

At the time of this report, 578 full pans have been disposed of, and work has continued when other duties at the station did not interfere and weather conditions were good. The amount reported removed was equivalent to 5.3 acres, according to estimates. Cost of the work was about $100 an acre.

After several months of operation using the alligator hand saws, we have mounted a power saw having a 54 in. diameter blade on the barge. This saw is belt driven by a Continental gasoline engine. To make the craft more maneuverable, we have added a second 25 horsepower outboard motor on the stern, thus facilitating the operation of the power saw. These improvements have considerably speeded up the removals accomplished by our barge.

CHAIN REACTION—(Left) Cold water cracks steam main, pavement erupts, and steam shoots 400 feet into air. (Right) Everything is flooded—streets, stores, basements, subways, and telephone lines.

Water Main Burst in New York City

Is Followed by Geyser and Flood

New York's Fourteenth Street "boiled over" in the Union Square area last August 2nd, as the above photographs show. It started with a break in a 36-inch water main, and continued with a steam explosion that spouted 40 stories into the air.

The break occurred just before 2 p.m. on a rainy Sunday afternoon, when traffic was light. Water rising in Fourteenth Street buckled the pavement, then gushed and spilled in all directions. The flood poured down steps into nearby subway stations and turned lower level tracks into foaming canals.

Within a short time, emergency crews of the Dept. of Water Supply, Gas and Electricity, police, fire, transit authorities, and other utilities were at work.

Then Stream Erupts

A spectacular eruption occurred at 3:40 p.m. Cold water caused a 16-inch steam main to rupture. Steam under 150 psi pressure shattered blocks of sidewalk, spouted debris, and shot a geyser of steam higher than the 425-foot Consolidated Edison Building across the street. A crew from the steam corporation soon closed off this break, and the steam subsided.

Final Problem is Drainage

The Fourteenth Street flood settled rapidly after Water Department crews valved off the break. Then fire department and transit authority pumping units started to operate.

By 5:30 p.m. water service was restored in all areas. One of the two flooded subway lines was in operation, and the second was running in time for the Monday morning rush.

Hundreds of men were engaged on many different repair projects. No one was injured, although more than a thousand persons were evacuated from a nearby movie house. Three subway trains were caught between stations when power was cut off, but were so close to stations that passengers could walk safely to stations outside the flooded area.

On the street level, water swirled into half a block of basement stores. At least 1500 telephones were put out of service, and scores of burglar alarms were affected—some were out of order, and some rang endlessly. For repair crews it was not a quiet Sunday!

COMMENTARY

The Current Stream Pollution Regulatory Situation*

by L. L. HEDGEPETH, *Technical Consultant, Calco Div., American Cyanimid Co., Bound Brook, N.J.*
(Editorial Associate)

> *"Inevitably, when public interest is manifested politicians exercise self-interest in the name of the public good . . . confusion is the result."*

IT is difficult—if not impossible—to discuss the current situation in regulatory stream quality control without first giving consideration to the underlying philosophy of stream pollution abatement. It is a field of thinking dominated for many years by love of nature and by public water supply considerations. Our knowledge of the mechanisms of pollution assimilation by the stream was scanty and we proceeded largely on the basis of a few standardized measurements and on many assumptions. It is a field in which nostalgia is the dominant factor in gaining the interest and support of the public.

Since before the turn of the century, and up to the close of World War II, stream pollution control was primarily a function of the fish life protectors and those charged with public water supply protection. The effects on many streams of the expansion of U. S. industry during World War II were so bad that public interest was aroused and many state laws were enacted.

In 1948, the federal anti-pollution law, commonly termed "Public Law 845," was passed by the Congress. This was intended to be a means of coordinating the work of the various states and a mechanism for federal intervention in case of failure of individual states to proceed against recalcitrant polluters. In practice, it actually turned out to be the basis of a bald attempt at empire building by the U. S. Public Health Service.

Inevitably, as always when public interest is manifested, the politicians in the State and Federal fields of government and in the professional groups practicing in the stream pollution field, exercised self-interest in the name of public good and confusion has been the result. It is axiomatic that when a layman gets a good look at some of the rotten spots of stream pollution, he is appalled at what he sees and tries to go too far. Too often his misdirected energy is welcomed by sanitary engineers as a usable means to gain their ends. We have had much of this during the past five years with the result of considerable lost motion along with some progress towards cleaner streams.

During the last two years the political pressure has lessened because of the shift of public interest to the Korean War. Since 1950, stream pollution control has in general received much less attention from the public than during its evangelical period of 1945-1950. This probably is because our country is now faced with the difficult problem of maintaining our economy in a continual state of war preparation for a period that promises to extend over many years to come. This condition makes it inescapable that the public lose interest in those activities which are rooted primarily in esthetics and conservation. And, stream pollution abatement *is* primarily a matter of esthetics and conservation.

The Case for Public Health Lacks Scientific Evidence

The case being made for stream pollution control from a public health standpoint has little scientific evidence in its support and, with the exception of the threat to public water supplies, is being discounted by professional workers in this field. Our polluted streams flow through healthy communities. Morbidity statistics do not support the adoption of stream pollution abatement measures as a means of improving public health. The case for these measures must today be made on the foundation of what is considered to be good public health practice and common decency, rather than on statistical evidence. The epidemiological evidence in support of the much publicized threat of stream pollution to public health, other than to public water supply, is lacking.

Even the threat to public water supplies is not as watertight a case as many of us would like to have it. Some of our most polluted streams—from sewage and industrial effluents—are serving as sources of public water supply for communities which enjoy extremely low water borne disease death rates. A residium of odor remindful of past pollution is often present, but the bad history is not manifested in presently measurable evidence of impairment of public health. This is but another way of

> *"Evidence to support claims that stream pollution is a threat to public health is lacking."*

*This commentary is based on a floor discussion presented by the author Oct. 24, 1952 before the Water Pollution Abatement Conference of the Manufacturing Chemists Association.

"These objectives, I believe, comprise the essence of justification of stream pollution abatement at this time."

saying that the art and science of water purification has kept pace with the increasing pollutional load on the streams.

A frequently used publicity device to secure public clamor for stream pollution abatement is to link the fear of the spread of poliomyelitis to stream pollution. The fact is that there is not a single case of polio on record which has been shown to be caused by drinking water. What evidence exists is sketchily presumptive and is too fragmentary for a scientific conclusion.

The laws of most states recognize a distinct difference between the threat of stream pollution to public water supplies and the threat to the general public health. The reasoning employed here is intended to emphasize this difference. The protection of public water supplies transcends all other considerations in stream pollution work. Dedication as a source of public water supply is today the highest use of a stream. Unhappy indeed is the wet process industry whose tail pipes discharge upstream from a public water supply intake. Unrelenting alertness as to process selection and adequacy of effluent treatment is its fate.

We have witnessed during the past year an attempt to use this difference in statutory and regulatory concepts of pollution control to curb the discharge of waste sodium chloride into inland waters. It is is a medical fact that the sodium intake of certain types of heart patients should be limited. In its report on the Muskingum River in Ohio, the Ohio River Water Sanitation Compact Commission (ORSANCO) has called attention to the necessity for reducing the sodium content in the diet of such people and has linked the discharge of waste brine in that river to the public health. At present, like polio, the evidence is based upon much assumption. If it can be made to stick, it will have a profound effect upon the future planning of the chemical industry. Due to the heavy consumption of soda alkalies, and the process use of large quantities of sodium chloride, nearly all chemical plant effluents are high in sodium salts.

It may well be that the work of such organizations as the Kettering Laboratory, The Public Health Service Environmental Center, and of the industry's medical divisions, will provide some precise answers to many of the moot questions which today confront us as to the place of stream pollution in the public health picture—but direct evidence is now lacking in support of most of the claims.

It is becoming increasingly clear that the motivation for honestly demanding stream pollution abatement at this time must be largely limited to the need for community decency and for conservation. There also exists the pressing need for more water and for a place to put the wastes of our growing communities and industries.

"Conservation for Wiser Use" and "Prohibition of Abuse"

These, objectives, I believe, comprise the essence of the public health justification of stream pollution abatement at this time.

And, the same may be said in part for the threat to fish life—the work of the biological research groups, such as the Johns Hopkins University and the Academy of Natural Science of Philadelphia, are showing that much of stream life degration, formerly attributed to pollutants, is really occurring because our streams and lakes are growing old and are changing in nature and aquatic population with changes in their environment. The automobile, the highway, with its draining of large areas—the human habitation of streams—the pressure of man; all are profoundly affecting the health and condition of recreational waters.

We are awaking today to the realization that the Pennsylvania Sanitary Water Board's concept in the mid-'20s was correct when, in setting up the early premises for stream pollution control in that state, it proposed use classifications of streams according to demonstrated needs. We are beginning to understand that the mere treatment of effluents, or the "bottling up" of wet processes, will not insure the restoration of polluted streams per se. The surface run-off of man's homes, schools, workshops, and recreation grounds all have their effect on the receiving waters. And this effect often is sufficiently cumulative to preclude the restoration of a polluted stream to a recreational or potable water supply classification, regardless of the degree of treatment of the effluents.

Recent Regulatory Developments

All of this is having its effect on the regulatory picture. The need for making our country strong and keeping it so—the need for new industries to support our growing population—the normal scramble among government units for more power—the search of the professional politician for a public interest to latch onto—these have caused some regulatory developments of relevent interest here.

Probably the most interesting one is the employment of a fish ownership legal device to hasten stream pollution abatement. In principle it is simple. The wild animals in the stream (i.e.—the fish, turtles, eels and shellfish) are declared to be the property of the state. Also, the habitat of this wild life (the water, the sides, the bottom of the stream) are declared to be the property of the state. This may be accomplished by a ruling from the Attorney General (as in Ohio in 1946 and 1948), or by legislation (as in Virginia in 1952). Thus the stage is set for a criminal action. If there is a fish kill, the miscreant is guilty of destroying public property and is required to make amends and correction. Fines of twelve, fourteen, eighteen, twenty-two, and twenty-four thousand dollars have been levied and most of them paid. In a public meeting last February, the Attorney General of Ohio (an elected official) outlined the success of his office in these cases and stated that it was his duty to protect the state's property and that he would do his duty. However, there is reason to believe that sounder judgment has prevailed in Ohio and that the competent and cooperative Department of Health will be given opportunity of working out Ohio's problem without resorting to police court tactics.

Now the thing that's wrong with this beautiful device is that it is outmoded. The history of stream pollution control shows that the impositions of fines do not correct stream pollution. Instead, they provide a sort of licensed prostitution situation which in the long run actually does more to impede than to promote the abatement of the pollution. It is much more economical to pay an occa-

"The thing that's wrong with this beautiful device is that it is outmoded."

sional nuisance fine than to really abate the pollution. Compliance with good stream sanitation measures may be best obtained through considerable technical work. Conclusions are, at best, based upon the judgment of skilled professional workers in industry and in government. Such people will find it difficult to work together if police actions are imminent. And, if they don't work together, neither is able to proceed on sound ground.

Fines vs. the Permit System

It may look good to the voter to impose fines upon a polluter but correction is not to be obtained in that manner for the bulk of industrial pollution. You cannot talk pollution out of a stream. You cannot fine pollution out of a stream. But we have this fear of punishment philosophy back with us—and it is growing. It has appeal to the wild life groups and many politicians.

The permit system of controlling pollution is growing. Viewed with alarm by many industrial men—but not by all of them—the study of and the issuance of, a permit for the discharge of prescribed industrial effluents into streams is proving to be a sound regulatory approach. The industrial resistance to it stems from fear of its abuse (as has been reported on water pollution and air pollution permits from California), and from the fact that the permit system can be used as a weapon of harassment to insure continual betterment of the pollution situation at each *individual* plant.

Its advantage is that it provides a definite means for the State to recognize the fact that any wet process industry must have some leeway in discharging process effluents, and for giving official permission to discharge them into the stream. It is also an excellent pollution inventory device for the state.

There hasn't been much change in the nature of stream or effluent standards. They are growing in regulatory favor because of the simpler administrative procedure that their use permits. ORSANCO, New York, North Carolina and South Carolina have recently become committed to standards as their major enforcement mechanism.

There is professional disagreement about standards in the water pollution field. This arises principally from our deficiences of definition and measurement. We have no really good definition for stream pollution and no universally applicable common denominators. As Tom Powers, Dow Co.'s sanitary engineer, has put it—"Our science is young and we have much to learn." There are large and poorly explored areas of ignorance in our science.

No hard or fast rule controls what is or is not pollution. A discharge which is a reasonable use of a stream under one set of conditions becomes an abuse under another set of conditions. Because of the ignorance factor in our work, and the fact that Nature herself is the greatest polluter of all, it is beyond the scope of human ingenuity to devise a precise expression of what is or is not harmful pollution under all the conditions of a stream.

"You can not talk pollution out of a stream: Neither can you fine pollution out of a stream."

"Like poison . . . pollution can be defined as 'too much' . . . too much of anything!"

Pollution is "Too Much" of Anything

Warren Watson's definition of a poison for human beings as being "too much" today remains the best definition for pollution. Pollution can also be defined as "too much"—too much of anything. How much is too much varies with the pollutant, the stream, the temperature, the silt load, the velocity, the turbulence, and the use. As our science develops and as some of our gaps of information are closed by our increasing search for new knowledge, we may be able to do better. At the present time, most of the regulatory officials are playing their standards by ear rather than by the prescribed statutory music.

Public Law 845 was almost lost during 1952 in that the Congress failed to extend it until the very end of the session. This was due to the fact that the Virginia Water Pollution Control Board, and the Pennsylvania Sanitary Water Board memorialized Congress to the effect that experience with Public Law 845, and its enforcement, had shown that the interests of the streams were not being served by this law. This was in line with the growing feeling that the Public Health Service was using this statute for empire building. As a result, much of the appropriation for its enforcement was lopped off and the Public Law 845 almost failed of renewal, being rescued only in the closing hours of Congress.

Our industry was instrumental in its rescue. This was because the Manufacturing Chemists Association recognized that there were some excellent features in the Public Health Service's stream pollution work, and that this agency was capable of great good in this field as it has been in the past in similar matters.

This about sums up the pertinent part of current developments—we continue to muddle ahead and make progress, particularly with new plants. The new construction in the chemical industry is including pollution prevention, and treatment of effluents. Many of our streams receiving effluents from older plants are becoming cleaner. Examples are the Shenandoah in Virginia, which has been restored for recreational purposes by the work of Merck and Company and the American Viscose Corporation; and the Schuykill in Pennsylvania which has finally responded to many years of work and expenditure of money by the polluters and the state.

If I have failed in this talk to be precise in defining and discussing water pollution it is because I find myself appreciative of the position of a learned judge who wrote:

"In this opinion we have carefully refrained from defining a fraud lest the devious mind of man devise a fraud that is without our definition."

WATER: The One Great Bargain!

Bearing the above title "Water—the one great bargain" is used as the theme throughout a most informative, easy-to-read, attention-getting, illustrated booklet produced in four colors by The Ottumwa Water Works of Ottumwa, Ia.

Here is a booklet expertly produced from otherwise deadly statistical facts relating to water supply, the service rendered and a chapter comparing values received in water service in comparison with other services and commodities in day-to-day life.

It will cost no more than a two-penny postal card to ask Supt. Geo. C. Ahrens for a copy of *"Water—the one great bargain."* It's well worth taking a look at.

WATER WORKS PRACTICES

OPERATION • MAINTENANCE • MANAGEMENT

Source of Supply

Part 1, Surface Water

The Fifth of a Series

by **GEORGE E. SYMONS,** ***Ph.D., Consultant & Technical Editor, Larchmont, N.Y.***

THE discussion of water supply sources is fundamentally a continuation of the subject "The Hydrologic Cycle" and a short resume of certain data from the previous lecture in the July issue is pertinent.

This article is one of a series on the general subject of "Water Works Practices." Each article has been developed by Dr. Symons from his notes for a Water Works Short Course and each is presented in the simple style of a short course lecture. The series has been designed to be of interest and aid to small plant operators, new operators, students, and any who may wish to review the fundamentals of water works practices.—The Editors.

A. Rainfall

1. SOURCE

The ultimate source of water is the ocean, from which water evaporates to form clouds, from which, in turn, water precipitates as rain, snow, or hail. It is from this precipitation falling on the earth's surface that all water supply for human use is derived.

2. PURITY

a. Rain contains less than 10 ppm of impurities, mostly dissolved gases from the atmosphere: Carbon dioxide, oxygen, nitrogen, ammonia, and nitrates, sulfates, and chlorides.

b. The solids content of rain water comes from dust, smoke, etc., in the air and is highest at the beginning of any rainfall. Snowflakes contain less impurities than rain.

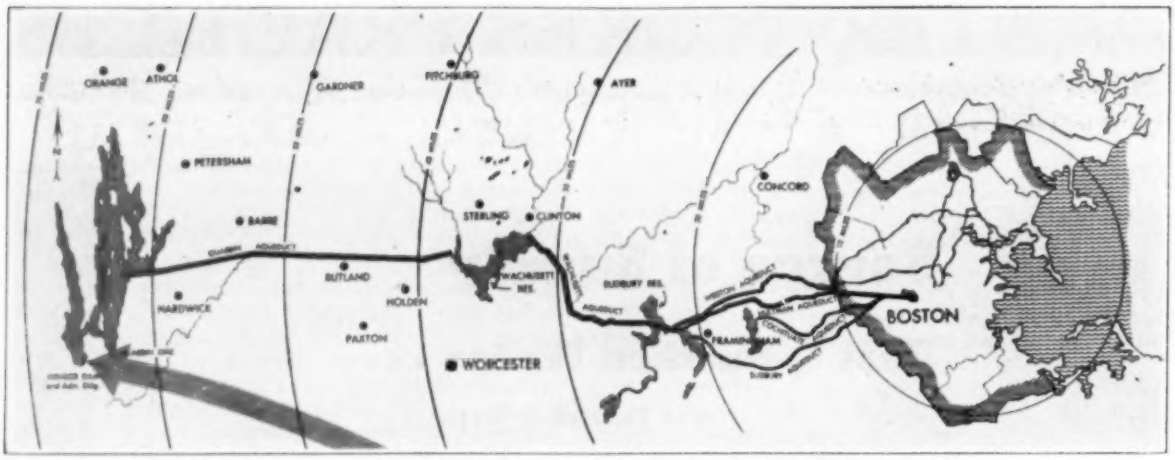
3. AMOUNT

a. In the United States, with an average annual precipitation of 30 inches on 1,935,000,000,000 acres, the total rainfall amounts to the fantastic figure of 432,900,000,000,000 gal. per yr.

b. On the average, about 21.5 inches of rainfall each year are lost to human use through evapo-transpiration and only 8.5 inches is available as runoff to surface water or underground storage.

This 8.5 inches is equivalent to 1,228,000,000,000 gal. per yr., one third of which first percolates into the ground to appear later as surface runoff.

FORTUNATE the community with a source of supply as clean as this upland stream.



BOSTON has had to reach out 65 miles for its major source of supply for the Metropolitan District.

c. Uneven distribution of both rainfall and runoff in the United States causes problems of water shortage and surplus. For example, the western 60 per cent of the U.S. receives less than 30 per cent of the precipitation, and whereas the average depth of runoff for the country is 8.5 in. per yr., the runoff in the eastern 40 per cent of the country is 15 in. per yr., while that in the western 60 per cent of area is only 4 in. per yr.

4. Use of Rainfall

a. In estimating the utilization of water resources, consideration is given only to the usage by man in various pursuits which are marks of civilization; namely, domestic water supply, industrial water supply, and irrigation.

b. In 1950, the U.S. Geological Survey estimated that the use of fresh water in the U.S. amounted to 173 bil. gals. per day, distributed approximately as follows:

Rural	3,500,000,000	gpd
Municipal	13,500,000,000	"
Industrial	77,000,000,000	"
Irrigation	79,000,000,000	"
Total	173,000,000,000	"

c. It is estimated that water requirements in the U.S. in 1975 will nearly double those of 1950, with an increase of 170 per cent in industrial use, 50 per cent in rural and municipal use and 25 per cent in irrigation.

B. Source of Supply

1. Definitions

a. Surface waters include: Wet lands, swamps, marshes, ponds, lakes, creeks, rivers, and impounding reservoirs.

b. Ground waters include: Water held in the earth (for any period of time) regardless of depth or type of earth strata in which it occurs. These strata may be loose material resting on rock, glacial drift (possibly in several layers) or porous stone formations.

2. Uses and Abuses of Water Supply

a. Water supplies are used for the following purposes: Drinking and domestic activities, industry cooling and processes, steam power generation, hydroelectric power, irrigation, crop nourishment, livestock, ice making, fisheries, game birds and wild life and recreation.

b. Water supplies are abused by: Human pollution, industrial wastes, floods artificially caused, low water artificially encouraged, silting and gravel wash, erosion of valley slopes, and river banks, salt water invasion, destruction of fish and wild life, destruction of natural reservoirs, and over-demand of supply.

3. Distribution of Public Water Supplies

a. A table of distribution of water supplies between surface and ground waters has been prepared by *Water & Sewage Works:*

Public Water Supplies
(Surface vs Ground Water)

Population (Thousands)	Ground Water		Surface Water	
	No. of Cities	Population	No. of Cities	Population
Over 100	22	3,085,455	144	30,382,555
50 to 100	20	1,481,810	61	4,880,250
25 to 50	67	2,406,860	115	4,594,185
10 to 25	268	3,953,690	284	4,709,565
5 to 10	543	3,581,070	323	2,569,715
1 to 5	3,256	6,995,830	1,193	3,581,315
Totals	4,446	21,504,715	2,120	50,717,585

b. In 1950 the U.S. Geol. Sur. estimated that 93,500,000 consumers were supplied with 13,640,000,000 gpd, of which 3,584,000,000 gpd was from ground water supplies and 10,056,000,000 gpd was from surface supplies.

4. Water Supply Shortages

a. Local water shortages have developed in various sections of the country, due to drouths (a temporary condition, which may last several years, however), or to overconsumption, or use beyond safe yield of the source of supply.

b. The 17 western states present the greatest water shortage problems. While these states have access to 350 bil. gal. of water per day, two thirds of it is in the Columbia and Pacific Northwest streams. As a result of this situation, Arizona, California, New Mexico and West Texas have overdeveloped their water supplies, much of the water being used for irrigation.

c. In the east, the major problem is not quantity, but poor quality of water due to pollution. Several large eastern cities have had to go some distance for water supply, notably New York City, Boston, Mass., and most recently Chester, Pa.

d. Ground water shortages result from pumping water at rates faster than the natural rate of recharge, or faster than the water can travel underground from the place where it enters the earth as percolating rain water; or from the transfer of underground water from one stratum to another; or from pollution either by

salt water intrusion or by industrial wastes.

C. Surface Water Quality

1. Streams and Rivers

a. The quality of water from surface sources depends on the character and area of the watershed, its geology, topography, nature of development by man, time of year, weather conditions, etc.

Streams are more variable than ponds or lakes. Water from limestone areas is harder and less corrosive than water from granite regions.

b. Streams consist of direct runoff, overflow from lakes and ponds, and seepage from high ground. In periods of high precipitation (or melting snows) streams or rivers are mostly direct runoff and the water is less hard than during drouths when the percentage of ground water seepage is higher.

c. Natural pollution consists of turbidity, color, odor, organic matter and other dissolved solids. The extent and character of this pollution depend on the type of soil and vegetation over which the runoff occurs.

d. Human pollution is more important; it consists of domestic sewage and industrial wastes and contains a high number of bacteria as well as turbidity, taste and odor producing compounds, color and other undesirable substances. The extent and characteristics of this pollution depend on the population tributary and the number and type of industries discharging wastes as well as the relation of the volume of sewage and waste discharged to the volume of the diluting water in the stream.

e. Physical, chemical, and biological characteristics of surface waters are affected by climatic, geographic and hydrographic conditions: Volume of flow is dependent on rainfall, runoff, and drainage area; temperature varies with the seasons and the geographic location; hard waters occur in calcareous (limestone) regions and soft waters occur in siliceous (sandstone) areas; aquatic growths and fish life depend on the region, also.

f. There are fifteen major drainage basins in the United States, each with its own quality characteristics, more or less. These drainage basins are: California, Colorado River, Great Basin, Lake Erie, Missouri River, New England, North Atlantic, Ohio River, Pacific Northwest, Southeast, Southwest-Lower Mississippi, Tennessee, Upper Mississippi, Western Great Lakes, and Western Gulf.

2. Ponds and Lakes

a. Water in ponds and lakes is generally the same as the water from tributary streams, but self-purification usually results in some improvement.

b. Self purification depends on size in relation to drainage area, detention period, shape, wind currents, etc.

c. Pollution may be caused by man, or by wave action or shores producing turbidity or by aquatic and algae growths.

Seasonal overturn of lakes and deep reservoirs affects quality. (This subject is to be dealt with in more detail in a later lecture on limnology.)

d. Principal lake systems used for water supply are the Great Lakes and the Finger Lakes of New York State. Minnesota, Wisconsin, Michigan, Indiana and Maine with thousands of lakes find use for relatively few as water supplies because of the distance to centers of population.

Madison, Wis., which is surrounded by four lakes, uses ground water, but Portland, Me., is proud of its famous Sebago Lake water which is brought from several miles away.

3. Impounding Reservoirs

An impounding reservoir is a basin created by damming the flow

LITTLE ROCK abandoned its nearby hard supply and went many miles into the hills to create Lake Winona—soft, pure, all gravity supply.

of water in a stream. Reservoirs being, in effect, artificial lakes they are similar to lakes in the matter of characteristics and control of quality. The design and development and control of impounding reservoirs is to be discussed in a later lecture of this series.

D. Eliminating Water Scarcity

1. Reduce Wasteful Runoff

Increase the total usable precipitation by:

I. Establishment of beneficial vegetable cover.

II. Elimination of vegetation which consumes large amounts of water.

III. Construction of impounding reservoirs to hold flood waters.

IV. Return used water to ground.

V. Artificial rainmaking.

2. Develop Special Industrial Supplies

Industries which do not need highly purified water, particularly for cooling purposes, should develop supplies for that purpose and reuse water where possible and use sea water or other non-potable supplies, if available.

3. Abate Pollution

Removal of domestic and industrial wastes from streams and underground waters will make available more water of better quality requiring less costly treatment.

4. Use Treated Sewage Effluents

Treatment of sewage makes available an excellent supply of water usable by industry for cooling purposes or with further treatment for other purposes. Best example of this practice is the steel plant at Sparrows Point, Md., which uses water from the effluent from trickling filters and the activated sludge treatment plant at Baltimore, Md.

Treated sewage as a source of water supply, without natural dilution in a stream, is frowned upon for psychological reasons and would present some problems of additional treatment to that normally given water supplies, particularly to prevent buildup of concentration of sulfates, nitrates, and chlorides. It is unlikely that sewage effluents will be used for producing domestic water supply until water needs become desperate.

5. Transfer Water Between Basins

As long as plentiful water supplies exist in one drainage basin but not in another, or not handy to a metropolis, the have-nots will develop ways and means to bring water long distances, if necessary, from the plentiful supplies. Los Angeles and Southern California, New York City, and Boston are examples of this approach, as is the development of water transfer in the Pacific Northwest and northern California.

6. Develop Purification of Sea Water

a. In 1952, the U.S. Govt. appropriated funds to the Office of Saline Research to study sea water purification. Its first report was a review of previously tried methods, titled, "Demineralization of Saline Waters."

b. All suggested methods to that date were too expensive, including distillation without or with solar radiation, ion exchange, and permeable membranes.

c. Chemists and chemical engineers believe this problem must be solved eventually or future expansion of agriculture and industry in some parts of the world will be stymied.

7. Adopt Operating Conservation Measures

a. Individual localities can often reduce their scarcity of supply problem by attention to operation features.

b. Universal metering of customers will reduce wasted water by an appreciable percentage, thereby extending the ultimate daily capacity of the supply for several years. Metering will also increase revenue per gallon of water pumped.

c. Where air conditioning uses are growing at appreciable rates, the use of water conservation units will reduce the total amount of water for that purpose to a fraction of what it would be without the practice of conservation.

d. Under conditions of local drouth, restriction of lawn sprinkling is often necessary.

e. Waste water surveys of the distribution system to eliminate leaks and reduce the amount of unaccounted-for water, is both excellent economy of operation and an effective means for increasing the maximum capacity life of the supply.

E. Reference Material

More detailed discussions of the various topics presented in this lecture are to be found in such texts as:

"Water Supply Engineering" by Babbitt and Doland (McGraw-Hill).

"Water Supply and Sewerage" by Steel (McGraw-Hill).

"Water Quality and Treatment" published by Amer. Wat. Works Assn.

"Special Editorial Report on Water" published by *Power Magazine*, Sept. 1952.

Next Lecture—
Source of Supply: Part 2; Ground Water.

Akron Water Department Makes History

First time any municipal department has won the highest citation from National Safety Council. Subject of special resolution by Mayor and Council.

The city of Akron, Ohio, can well be proud of the safety record of the Akron Water Dept. For the year 1952 this record discloses only one lost-time employee injury during 447,095 man-hours of work. This figure becomes the more impressive when expressed as a frequency rate of 2.2 injuries per million man-hours, an amazingly low figure when compared with the national average for the water supply industry.

In presenting the award at an open meeting of the City Council, C. F. Alexander, director of industrial safety for the National Safety Council, pointed out that the award was history-making in that Akron is the first city ever to receive the citation for any branch of municipal employment.

Subsequent to the presentation a special resolution (also history-making) was drawn by the Mayor and Council-as-a-Whole "congratulating the Akron Bureau of Water Supply upon its safety record which has won for the Department the highest citation of the National Safety Council." The resolution emphasizes the fact that the citation is a "first" in that it represents the first time that this high N.C.S. award has ever been given to any branch of municipal employment.

Those who know of the interest taken in "Safety" by Wendell LaDue, superintendent of the Akron Water Dept., over the past decade or more and his efforts in the interest of advancing safety in water and sewage works operation (including his service as A.W.W.A. representative on the Presidents Committee on Industrial Safety) will know who the "spark plug" was in the development of Akron's award winning safety record.

Fundamental Principles of Handling Chlorine

III—Chlorine Gas Masks

by **V. W. LANGWORTHY**, *Research Chemist, The Chlorine Institute, Inc., New York*

A SERIES of articles dealing with techniques for handling a toxic gas such as chlorine should include information regarding respiratory protective devices. This installment will describe functions of the U.S. Bureau of Mines, general types of chlorine gas protective devices, their specific uses, and the limitations of each type.

Chlorine is a widely used tool in the treatment of water, sewage, and industrial wastes. Fundamental knowledge of handling this tool is important because of its potentially hazardous characteristics.

In this series of articles on handling chlorine, Mr. Langworthy summarizes useful information and describes good practices. Each article has been designed to be of practical value to all users of chlorine.

Bureau of Mines

The Bureau of Mines of the United States Department of the Interior performs valuable services in connection with the promotion and use of safe, satisfactory and reliable respiratory-protective devices. To accomplish this broad program, the Bureau has established schedules of minimum requirements for the several types of breathing apparatus. Approval tests on self-contained breathing apparatus are conducted by the Safety Branch of the Bureau; tests on all other respiratory-protective devices are carried out by the Health Branch.

Equipment which has been submitted for approval and meets the Bureau's requirements is granted a certificate of approval, stating that the apparatus has passed the Schedule of Requirements and describing existing limitations. It should be noted that if approved devices purchased on the open market fail to pass prescribed tests, the approval certificate for the device may be rescinded.

Lists of approved devices are published periodically for the information of the public. A recent list was published as Bureau of Mines Information Circular 7636 dated June, 1952.

Types of Chlorine Gas Protective Devices

Devices classified as respiratory-protective include self-contained breathing apparatus, gas masks and supplied-air respirators.

All devices satisfactory for chlorine protection consist of a face mask connected either to an oxygen or air supply, or to a suitable canister which generates oxygen, or to a canister capable of absorbing specific quan-

M.S.A. Photo

Fig. 1—GOOD VISIBILITY is an important feature of modern gas masks

Men are wearing self-contained breathing apparatus of a type in which the user's breath generates oxygen from a chemical compound.

M.S.A. Photo

Fig. 2—CHEMOX apparatus, an oxygen generating device
Maximum canister service is 45 minutes.

Scott Aviation Corp. Photo

Fig. 3—SCOTT AIR-PAK self-contained compressed air device
Maximum service of refillable cylinder is 30 minutes.

tities of chlorine from the atmosphere.

The face mask is molded of flexible material and, when worn, is held in place by means of straps and friction clasps (see Fig. 1). *The mask must fit tightly:* allowing leakage of gas through or around the face mask is obviously courting disaster. Immediate rejection or repair is the only procedure when the face mask leaks.

Transparent ports in the face mask make vision possible. These ports vary widely in size and shape, and modern masks include circulation for fog prevention during use. Protective devices for use in a chlorine atmosphere should be restricted to those which include eye protection, due to the irritating nature of moist chlorine.

Provision for exhaust air is accomplished by various types of valving devices which remain tightly closed during the intake cycle of breathing.

Connections between the face mask and other parts of the apparatus utilize flexible tubes which permit free head movement. This tubing is resistant to crumpling and deterioration, and is vital to continued dependability of the mask; hence it should be subject to frequent critical inspection and testing for leaks.

Mask Inspection

Face masks and connecting tubing must be inspected regularly, certainly at intervals no longer than quarterly. The inspection should include visually examining all parts of the apparatus, then placing the mask upon the face, as in actual service.

To test for leaks, pinch off the corrugated connecting tube near the face-piece and inhale deeply. The face-piece must collapse completely to indicate airtightness of mask and tube connection. A similar procedure may be followed to check the condition of the connecting tube, by pinching the tube near the connection farthest from the face-piece and inhaling deeply.

In the event that leaks are found in either the face-piece, tube or tube connections, and if tightening of elastic straps and bolts does not prevent leakage, the only solution is to replace the complete face-piece with flexible tube attached. It is dangerous to take chances with a leaky gas mask, since a user will enter a contaminated atmosphere believing that he is protected against chlorine gas, only to inhale gas through the leaky parts of the device, with possible dire consequences.

Self-Contained Breathing Apparatus

As the name implies, a self-contained breathing apparatus is equipped with an oxygen or air supply as an integral part of the protective device. Use of this type of equipment is mandatory in working areas which are deficient in oxygen, or when a toxic gas exists in a concentration so high (above 2 per cent) that canister type masks are rendered useless.

The Bureau of Mines has issued certificates of approval for the following self-contained respiratory-protective devices (as of June 1, 1952):

Chemox oxygen breathing apparatus (¾-hour self-contained oxygen breathing apparatus). Approval BM-1307, issued to Mine Safety Appliances Co. October 3, 1946. Cat. No. B-46328 Chemox Canister, Cat. No. B-45151.

Scott Air-Pak self-contained breathing apparatus (½-hour self-contained compressed air breathing apparatus). Approval BM-1308, issued to Scott Aviation Corp., October 3, 1946. Model 6000-A2M.

M.S.A. demand-type oxygen apparatus (½-hour self-contained compressed oxygen breathing apparatus). Approval BM-1309, issued to Mine Safety Appliances Co., October 3, 1946. Cat. No. B-45950. Oxygen cylinder, Cat. No. B-45153.

M.S.A. demand-type air apparatus (½-hour self-contained compressed-air breathing apparatus). Approval BM-1310, issued to Mine Safety Appliances Co., November

M.S.A. Photo

Fig. 4—M.S.A. self-contained demand type oxygen device
Maximum service of refillable cylinder is 30 minutes.

M.S.A. Photo

Fig. 5—M.S.A. canister type chlorine service mask in use
Gas concentration determines service of canister.

26, 1946. Cat. No. B-46307. Air Cylinder, Cat. No. B-45843.

As will be noted from the above list, self-contained breathing apparatus operates for a specified length of time in an atmosphere deficient in oxygen, an important factor when high toxic gas concentrations exist. The time element is most important and the devices approved by the Bureau of Mines indicate service time remaining.

In the case of Chemox apparatus, a 45 minute timer may be set, with discard of a canister after use of any amount. The device may be tested for leaks by grasping the flexible inhalation tube and inhaling deeply. Collapse of the face piece indicates sufficient tightness and proper functioning of the exhalation valve. Similar procedures are used to insure tightness of the inhalation valve and exhalation tube. The breathing bag may be checked by depressing both elbows firmly, if the bag does not deflate, the apparatus is tight.

The Chemox apparatus is an oxygen generating, canister-type device which utilizes the user's breath to activate an oxygen generating compound. This device is light weight (13½ lbs., complete) and has no high pressure cylinders, valves or fittings (see Fig. 2).

The Scott Air-Pak apparatus utilizes compressed air which is supplied to the user from a back-carried refillable cylinder, having 40 cu. ft. capacity, sufficient for 30 minutes use at extreme exertion. This device features a demand regulator which gives continuous indication of air supply remaining in the cylinder. The regulator is equipped with a radium dial and is located in full view of the wearer. Protection against regulator failure is afforded by an emergency by-pass valve which will allow a constant flow of air to the mask (see Fig. 3).

The M.S.A. demand-type devices each supply 30 minutes service, one utilizing compressed oxygen and the other compressed air. Both employ back-carried, refillable cylinders having 40 cu. ft. capacity, sufficient for 30 minutes use at extreme exertion (see Fig. 4).

The demand regulator continuously indicates the amount of service remaining and is located in full view of the wearer. The regulator may be by-passed in event of failure, providing a constant supply of air or oxygen to the face mask, with any excess air discharging through the exhalation valve or around the face mask.

Gas Masks
Canister Type

Canister type respiratory protective masks are used extensively in the sanitation field, with an admirable history of service. They are satisfactory for chlorine service when a gas concentration of two per cent (20,000 ppm) or less prevails in the atmosphere (see Fig. 5).

It should be emphasized that canister type gas masks can be used safely only when oxygen is present in life-supporting concentration. Canisters remove contaminants during inhalation—they do not supply oxygen: the decontaminated volume of air supplied to the respiratory system must contain sufficient oxygen or suffocation will result. The rupture of a chlorine package coincident with fire where an oxygen deficiency could occur, could create a situation requiring the use of either self-contained or supplied air respiratory-protective devices to combat the emergency effectively.

The life of the canister depends on the concentration of chlorine in the atmosphere. Effective service life may be several hours when exposed to very low concentrations of chlorine, but at high concentrations a canister may have a service life of only 15 minutes. At Detroit, for example, the *average* life of the canister is set at two hours.

Another limitation applies to canister type gas masks besides that of gas concentration. A common oversight among operating personnel is found in canister inventory, where seals have been removed to render masks instantly available for protection. Canisters, installed in the mask

proper *with seals broken*, do not retain their chlorine absorptive capacity for an extended period and must be replaced immediately after use, or within one year, even though not used. Spare canister inventory should be stored with seals intact and dated so that rotation of new supplies is possible. Canisters older than four years are unreliable and must be rejected.

The Bureau of Mines has issued certificates of approval for canister type gas masks suitable for use in a chlorine contaminated atmosphere. Such approval is included under schedule 14, a schedule which is changed from time to time so that Bureau requirements keep pace with technical advancements. Following are names and addresses of companies to which approvals have been granted (as of June 1952) as published in Bureau of Mines Information Circular 7636:

Acme Protection Equipment Co.
3037 West Lake St.
Chicago 12, Ill.

E. D. Bullard Co.
275 So. Eighth St.
San Francisco, Calif.

Davis Emergency Equipment Co.
45 Halleck St.
Newark 4, N. J.

Mine Safety Appliances Co.
Braddock, Thomas and Meade Sts.
Pittsburgh 8, Pa.

Willson Products, Inc.
Reading, Pa.

It is recommended that canister type masks be inspected *monthly* by checking the face mask and connecting tubing as mentioned earlier in this article. Operating personnel must be thoroughly acquainted with all mask locations, spare canister storage, and mask inspection procedures.

Masks should be located immediately available to, but outside of, chlorine feeder and scale rooms, and the chlorine package storage area. Canister inventory should be so located that spares are easily accessible in a cool, dry place.

Supplied-Air Respirators Hose Type Mask

Hose type masks supply air to the wearer through a length of hose and are available with or without hand operated blowers. It is apparent that such a respiratory protective device must provide clean breathable air, delivered from outside the contaminated area to the wearer, thus caution must be exercised when using this type equipment, which usually is available with 150 feet of hose (75 feet without blower).

The air hose is of large inside diameter, approximately 1", to enable a wearer to secure air through it in case of blower failure. Resistance to deterioration and crushing weights are factors considered in designing hose for supplied air respirators.

It is again pointed out that hose type masks require provision of clean breathable air to the wearer, limiting their use somewhat in chlorine contaminated atmosphere. They may be used to good advantage, however, in tank cleaning, underground repair work and in other confined spaces.

The Bureau of Mines approves hose masks with blowers for respiratory protection in any atmosphere regardless of degree of contamination or oxygen deficiency, providing clean breathable air can be reached within the permissible hose length. The Bureau of Mines covers this class of equipment in Approval Schedule No. 19.

Summary

Increasing attention to safety programs in the sanitation field provides opportunities to analyze hazards existing in our plants. A critical survey of the entire chlorine handling system is certainly in order at any time. While leaks in piping and other appurtenances cannot be predicted, it is possible to predict at all times the condition of protective devices and safety equipment.

Every employee should be trained in the use of protective devices he is expected to use under emergency conditions. Regular rehearsals, for example, which include the entire testing procedure and wearing of the equipment will increase the efficiency of an operator faced with a combination of circumstances requiring immediate action—*and may save his life.*

Acknowledgment

The cooperation of manufacturers of respiratory-protective devices and of their representatives in providing material and illustrations for this article is appreciated.

Cathodic Protection Short Course Planned at Univ. of Ill.

A short course devoted to cathodic protection will be held at the University of Illinois, Urbana, Ill., October 12 to 16. The course is sponsored by the National Association of Corrosion Engineers and the University.

Topics for study and discussion will be Principles of Electrochemistry for Corrosion Engineers, Review of Electric Circuit Theory, Corrosion Engineering, Economics and Management Problems in Corrosion and Cathodic Protection, Design and Application of Cathodic Protection Systems, Instruments and Measurement Techniques for Corrosion and Cathodic Protection, and Field Testing Practices (in Laboratory).

Attendance at the course will be limited to 50 persons. Cost will be $47.50 payable to the university, including a fee of $37.50 for lectures, laboratories and demonstrations with dittoed notes from the lectures and a notebook to hold them and $10 for five luncheons and a banquet.

Edwards Heads Chicago Office of Stanley Engineering Co.

The Stanley Engineering Co., Muscatine, Iowa, opened a Chicago office on August 1st in the Utilities Bldg., 327 LaSalle Street, to provide improved consulting service to clients in the Chicago area.

Mr. Frank W. Edwards will be in charge of this office. Since 1948, Mr. Edwards has been director of Civil Engineering at the Illinois Institute of Technology. Prior to his association with the Illinois Institute of Technology, his experience included teaching at Carnegie Institute of Technology and at Pennsylvania State College, and a number of years with the United States Engineers with major responsibility on design of civilian and military projects. He is the author of a number of engineering articles.

Mr. Edwards is a member of the American Society of Civil Engineers and is president of the Illinois Section. He also belongs to the American Society of Mechanical Engineers, Western Society of Engineers, and is a member and past president of the Chicago chapter of the Illinois Society of Engineers.

Pollution Control Progress Reported at Ohio S. & I.W. Conference

Variety of Technical Papers at 27th Annual Meeting

A Report by **ARTHUR ROBINSON**, *Director of Public Relations, Water Pollution Control Board, Columbus, Ohio*

THE 27th Annual Meeting of the Ohio Sewage and Industrial Wastes Treatment Conference, held in Akron, June 17-19, was marked by a larger attendance and a more extensive program than in previous years. The total registration was nearly 300, the increase of 50 per cent over last year's meeting being in industrial representation.

Industry came in for a greater share of the program than ever before. The program committee for the first time found it necessary to offer two concurrent sessions on industrial wastes topics, along with the single meeting on sewage problems. There were also several combined sessions.

Officers Elected

Outgoing chairman of the Conference is Donald G. Stevens, Chief of Technical Services, Standard Oil Co. of Ohio.

Officers elected to serve for the coming year are:

Chairman
W. D. Sheets, Research Engr. in Charge
Wastes Treatment Laboratory
Ohio State Univ.

First Vice-Chmn.
Grant A. Pettit, Director
Industrial Wastes Control
Armco Steel Corp., Middletown, Ohio

Second Vice-Chmn.
Franklin Ruck, Supervisor
Water and Sewage Plants
Troy, Ohio

Secretary-Treasurer
Ward E. Conrad, Asst. San. Engr.
Ohio Dept. of Health
Columbus, Ohio

NEW OFFICERS—Ohio S. & I.W. Treatment Conference
Seated are: W. D. Sheets, Chairman, and Ward E. Conrad, Secretary-Treasurer. Standing: Grant E. Pettit, First Vice-Chmn., and Franklin Ruck, Second Vice-Chmn.

Technical Program

"THE ROLE OF INDUSTRY IN THE OHIO RIVER VALLEY POLLUTION CONTROL PROGRAM" was discussed by Edward J. Cleary, Executive Director and Chief Engineer of the Ohio River Valley Water Sanitation Commission.

He referred particularly to the Industry Action Committees of the Ohio River Commission, which have been formed with the full cooperation of the steel, metal finishing, distillery, chemical salts, oil refining, coal and organic chemical industries of the area.

These committees now have more than 80 members, top experts in their fields who have been given a green-light by their companies to share actively in the development and promotion of the Ohio River pollution abatement campaign.

Among accomplishments of these committees to date, Mr. Cleary listed:

1. Consultations with the Commission and its eight member states in the establishment of water quality objectives and waste treatment requirements.

2. Assembly of data as an aid in reaching technical decisions.

3. The conduct and coordination of research looking toward new methods of waste treatment.

4. The genesis of a rational program of pollution control based on the needs and economics of the Ohio River Valley.

5. The dissemination and promotion of waste-control thinking within the ranks of specific industries.

6. Support of the Commission's project on toxicity of substances in water, an operation being sponsored at the Kettering Laboratory (in Cincinnati) which is opening new vistas in pollution control.

Dr. John D. Porterfield
Director, Ohio Dept. of Health
Chairman, Pollution Control Board
Columbus, Ohio

Industry Progress Report on Pollution Control

Mr. Cleary said:

"A good part of the obvious success of this teamwork rests in the un-

PAST CHAIRMEN

Donald G. Stevens (second from right), retiring chairman, is welcomed into the retired ranks by three other past chairmen of the Conference (left to right) Walter E. Gerdel, superintendent of the Southerly Sewage Treatment Plant, Cleveland; W. R. Bowman, supt. of water and sewage at Newark, Ohio, and (extreme right) Hubert S. Kline, Frigidaire Corp., Dayton.

derstanding by the industry committees that they have been invited to form a part of our Commission in fact as well as in spirit.

"Now that the time is approaching for drafting industrial waste control measures in the Ohio River and interstate tributaries, the role of the committees will reach its greatest significance.

"Let us not overlook the fact that in the Ohio River Valley, as in other river basins, the abatement of pollution means the imposition of regulations on an existing framework of physical and economic development. How this can be accomplished with a minimum dislocation of this framework, and with assurance that the benefits are related to costs, is a nice exercise in ingenuity."

Mr. Cleary's talk was followed by a series of informal reports on progress within specific industries by C. A. BISHOP, research associate, U. S. Steel Corp., Pittsburgh; HENRY F. HEBLEY, research consultant, Pittsburgh Consolidated Coal Co., Pittsburgh; OSCAR KROPP, Standard Oil Company of Ohio, Cleveland; FRED J. GREINER, Columbus, executive secretary, Ohio Dairy Products Association; L. J. HIBBERT, National Cash Register Co., Dayton; and ANTHONY PALLADINO, of the National Council for Stream Improvement, New York, representing the paper industry.

A further example of the development of cooperation in the approach to industrial waste problems was related by Mr. Greiner. He told the story of a relatively small Ohio industry comprising Swiss cheese makers who joined together to employ one engineering firm to prepare plans for a type of treatment facility which might be adaptable to all 20 plants.

The State's Campaign Shows Results

DR. JOHN D. PORTERFIELD, director of the Ohio Department of Health and chairman of the Ohio Water Pollution Control Board, reported on general progress in the anti-pollution campaign in Ohio.

In seven of the largest cities of the state alone, sewage treatment construction projects are under way which will cost more than $80,000,000. Most of these are expansions of existing plants, but the Cincinnati project is entirely new as was the Canton project recently completed.

He said 10 smaller cities and seven villages are constructing new sewage treatment plants this year, while 12 other cities and six villages are constructing additions to present plants.

Believed to be near the construction stage are 20 other cities and 47 villages which have completed detail construction plans for sewage treatment works and are now working on financial arrangements. These are communities which now lack sewage treatment.

Another 29 cities which have sewage treatment facilities considered inadequate are putting the final touches on plans for expansion of their plants, he said.

On the industrial side in Ohio, Dr. Porterfield said all the estimated 550 industries which discharge wastes directly into waters of the state are expected to be under the state's new permit control program by the end of this year. At the time of the conference, 390 were under permit with orders to take specific steps toward pollution control if they did not already have adequate waste treatment facilities.

Of the 390 under permit, he said, 116 have waste treatment facilities now, but 19 of these are known to be inadequate and in need of improvement. Of the remaining 274 industries under permit, 24 have treatment facilities under construction; 146 are working on construction plans.

Many Studies Advanced by P.H.S. Research

In a report on work of the Environmental Health Center of the U.

SPEAKERS at the Conference

(Standing) Edward J. Cleary, Executive Director and Chief Engineer, Ohio River Valley Water Sanitation Comm.; (left) L. J. Hibbert, National Cash Register Co., Dayton; and (center) Henry F. Hebley, Pittsburgh Consolidated Coal Co.

S. Public Health Service at Cincinnati, V. G. MacKenzie, officer in charge of the Center, sounded a warning.

"Many sanitary engineers and other public health workers have become complacent about the current relative success of control measures for the prevention of the spread of water-borne disease," he said. "I have heard some responsible individuals advocating a lessening of controls and standards governing current water supply practice.

"Yet an occasional infrequent outbreak—such as at Rochester, New York, and Newton, Kansas—still brings home to us the realization that our current freedom from water-borne enteric diseases is only maintained at the cost of perpetual vigilance.

"Fewer of us realize that there is ever-present danger of water-borne transmission of other diseases, about the control of which we know less. I have heard concern expressed by nationally recognized authorities regarding the possible water-borne transmission of virus diseases—polio and infectious hepatitis—the latter certainly a real problem.

"Research work done to date certainly does not clearly delineate the degree to which current water quality controls can be relied upon to remove or inactivate infective viral agents in water." Studies of the Coxsackie virus indicate that the virus persists in sewage and in unpolluted water for days, and that higher levels of chlorination than are routinely practiced are required for its inactivation.

AMONG THOSE PRESENT

Russell Bowers, manufacturers representative of Cleveland; Frank W. Jones, consulting engineer with Havens & Emerson, Cleveland; G. A. Hall, engineer-secretary, Ohio Water Pollution Control Board, Columbus; Earl Flower, commissioner, Department of Sewage Disposal, Cleveland; and John Barrett, superintendent of the Cleveland Westerly Sewage Treatment Plant.

"I would like to mention another problem of possible water-borne disease," Mr. MacKenzie continued. "Morbidity statistics and epidemiological studies have shown that human infections due to certain pathogenic fungi — histoplasmosis and others—are much more common in certain major river valleys than elsewhere. For instance, over 80 per cent of individuals tested in Cincinnati show evidence of prior histoplasmosis infection, as compared to only 10-15 per cent in Columbus. The Public Health Service is supporting research at the University of Kansas on the efficacy of removal of histoplasma capsulatum by standard water purification processes."

Mr. MacKenzie reported that in the field of radiological health, a number of continuing projects are under way at the Center in Cincinnati and at Oak Ridge National Laboratory on the effectiveness of water purification processes in the removal of radioactive contaminants. Studies on methods of decontamination of radioactive waste materials are being carried on in the Cincinnati laboratories and at Los Alamos in cooperation with the Atomic Energy Commission. Attention also is being given to the fate of radioactive substances discharged to natural waters and the effects produced, particularly with reference to aquatic life. A report on a study of the latter subject on the Columbia River is currently being prepared.

Referring to development of new analytical procedures at the Center, Mr. MacKenzie told of the use of the molecular filter technique for coliform checks in areas not easily reached for sampling in the past. Another promising technique receiving attention relates to the collection and analysis of trace organic materials in water; the trace materials are adsorbed by the passage of several thousand gallons of water through an activated carbon filter, adsorbed materials are then eluted from the carbon by solvents and the eluted material subjected to organic analysis.

MANUFACTURERS at the Conference

Three members of the Manufacturers Committee at the Conference were (left to right) R. F. McGivern, Columbus; George A. Horlacher, Cleveland; and R. W. Campbell, Cleveland.

Report on Beryllium

This discussion led quite naturally to the next subject on the well organized program:

"A Report on the Toxicity of Beryllium" by Carl S. Pomelee, chief research chemist with the Brush

SESSION on municipal problems

F. H. Waring, chief engineer of the Ohio Department of Health, answers questions of plant operators. Presiding is W. D. Sheets, new chairman of the Conference.

Beryllium Company at Luckey, Ohio, near Toledo.

"On the subject of the toxicity of beryllium, you have probably heard from one source or another that the toxicity is very serious, and the material is to be handled with caution. Our experience does not indicate that this is so. To a certain extent, I would liken the public scare concerning the toxicity of beryllium to the alleged toxicity of aluminum during its early history," Mr. Pomelee said.

He said that to date there is no indication that beryllium in any form can produce a toxic reaction when entering the body through the digestive tract.

Water-soluble salts of beryllium may cause sterile ulcers upon entering breaks in the skin, but these ulcers apparently do not cause any general systemic reaction or any permanent damage beyond the formation of scar tissue, he said.

"On the other hand, it has been determined, although not positively established, that certain beryllium compounds are responsible for acute respiratory reactions. But again, it must be stated that there is quite a range of individual susceptibility. One of the puzzling factors of the toxicity of beryllium to the respiratory system is that over 80 per cent of the chronic berylliosis cases on record are attributed to individuals who have never had any connection with the production of beryllium, its alloys, or its compounds."

Mr. Pomelee reported a number of supporting toxicity studies made on dogs, rats and fish. He also reported on methods of waste disposal developed at the Luckey plant.

More Technical Papers

Among other technical papers presented at the Ohio Conference were: a report on SEWER PIPE ROUGHNESS COEFFICIENTS by Kenneth W. Cosens, associate professor of sanitary engineering at Ohio State University; STORM WATER PROBLEMS by D. D. Heffelfinger, engineer-superintendent of water and sewage at Alliance, Ohio; CONSERVATIVE CONSTRUCTION by E. F. Wittmer, sanitary engineer for the Ohio Department of Public Welfare, in charge of institutional sewage treatment installations; MUNICIPAL FINANCING FOR SEWAGE TREATMENT by H. J. Crawford, chief of the Municipal Bond Department, Squire, Sanders & Dempsey, Cleveland.

Special Sessions

The Ohio Conference this year also featured a number of open forums and panel discussions on both municipal and industrial sewage and waste treatment problems. Among the leaders of these discussions were W. D. Sheets, new chairman of the Conference; Grant A. Pettit, the new first vice-chairman; and Hubert S. Kline, of the Frigidaire Corporation, Dayton, a past chairman.

There also were sessions at which state officials were available for question-and-answer periods, including F. H. Waring, chief engineer of the Ohio Department of Health; Bruce M. McDill, engineer-in-charge of the Water Pollution Control Unit of the Ohio Department of Health; and G. A. Hall, engineer-secretary of the Ohio Water Pollution Control Board.

NEW WATER & SEWAGE BOOKS

Pumps. The new second edition of a book by Frank A. Kristal and Fred A. Annett. (McGraw-Hill Book Co., New York, N. Y.—$6.50).

Here is a discussion of a wide range of pump types and designs, the kinds available, how to select and install them, how to operate and maintain them, and how to locate and remedy troubles. Here is a review of pump applications for many special uses—including the handling of sewage and sludge.

Here also is an explanation of the performance features and service limitations of various types of pumps, their construction features, and the materials used in manufacture. This revised edition of the book covers new developments in diaphragm, variable-displacement, proportioning, self-priming, regenerative turbine, rotary, jet, and many other types. Altogether, a specialized reference work.

Pipefitters Handbook. By Forrest R. Lindsey. (The Industrial Press, New York, N.Y.—$6.00).

The author, with 35 years of experience, has compiled many practical tables and figures to quickly solve shop or field problems in pipe layout, fitting, bending, offsetting, mitering, etc.

Much useful information is given on related subjects such as: pipe data, screwed fittings, butt welding fittings, flanged fittings, valves, solder joint fittings, and miscellaneous computations. Even a glossary of terms—a pipefitter's dictionary—is provided.

The book contains 282 pages, size 4x7 inches, and is bound in flexible maroon fabrikoid.

Safety in Sewage Works Maintenance and Operation

The Third of a Series

by **LEROY W. VAN KLEECK**, *Prin. San. Engr., Conn. State Dept. of Health Hartford, Conn.*

THIS installment continues our discussion of employee safety in sewers. The second installment (in the August issue of *Water & Sewage Works)* described hazardous conditions and gases encountered in sewers. Following is a review of equipment and procedures recommended for *detecting* the hazardous conditions.

Prevention of Dangers from Noxious Gases or Vapors and Oxygen Deficiency

Detection Equipment

Many types of testing equipment are available for detecting hazardous conditions in underground structures. Only the simplest and least expensive procedures are given here. The testing methods to be given are all sufficiently accurate for the purpose of preventing injury or death to human beings in underground structures. The total cost of providing this equipment is less than $125. This should certainly be a reasonable expenditure for any public works department.

Consider the hypothetical case of John Doe, age 35, salary $3500 per year, married with two children. He dies in a manhole deficient in oxygen. If John Doe had lived and worked till age 65, even assuming no increase in salary, his future earnings would have been $105,000. Isn't $125 pretty cheap insurance on such an investment? Quite aside from monetary considerations his wife wouldn't be a widow and his kids, orphans.

Tests for noxious gases or vapors and oxygen deficiency should be made in the order given below. When the exact depth of a structure is known, it is desirable to lower the sampling hose or testing equipment through a ventilating hole in the *undisturbed* manhole cover, or the cover may be cracked open slightly, care being taken to avoid a spark. Otherwise the cover is completely removed and the tests made.

While various gases may stratify at different elevations in the manhole shaft, it is common practice to make one test at a depth about 6 feet above the manhole floor on the theory that lighter than air gases will be vented from the manhole after removal of the cover. The suggested point of testing represents the working height and is generally considered sufficient. If, however, flammable gas is detected near the bottom of manholes with a combustible gas indicator, as described below, it is wise to continue testing throughout the depth of the manhole shaft.

Testing for Flammable or Explosive Gases

Gases or vapors of this type may be produced by gasoline, manufactured fuel gas, natural gas, hydrogen, carbon monoxide (in explosive amounts), methane, hydrogen sulphide (in explosive amounts), ethane, ammonia (in explosive amounts), etc.

Inexpensive combustible gas indicators, sometimes called explosime-

Fig. 1—COMBUSTIBLE gas indicator
Small portable type using probe rod attached to end of sampling hose.

Fig. 2—EXPLOSIMETER is another name for combustible gas indicator
This shows the aspirator bulb and indicating scale of portable instrument demonstrated in Fig. 1.

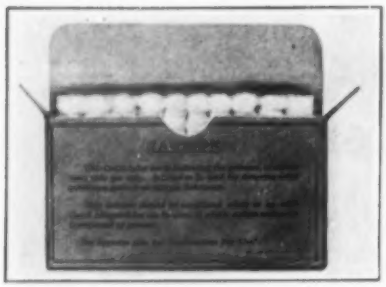


Fig. 3—CARBON monoxide gas ampoules
For estimating gas concentration

CARBON MONOXIDE DETECTOR
COMPARE AMPOULES WITH COLOR SCALE BELOW
DANGEROUS Do Not Enter Manhole
Caution
KEEP OUT
0
10
CARE FOR VENTILATING MANHOLE IN ALL CASES WHERE TEST SHOWS PRESENCE OF CARBON MONOXIDE GAS
DO NOT
OBSERVE THE ABOVE RESTRICTIONS IN ALL CASES

Fig. 4—COLOR scale for carbon monoxide
Gas ampoules, after 1 min. exposure to sewer atmosphere, are compared with this color scale.

ters, may be used. (See Figs. 1 and 2). Several manufacturers of safety equipment can supply these devices at a cost of $75 to $85.

These instruments are battery-operated units, which operate by oxidizing or burning a sample of the atmosphere under test over a heated catalytic filament which is part of a balanced electrical circuit. Any combustible gas or vapor in the tested sample will unbalance the circuit, cause a deflection of the meter pointer, and thus indicate on a scale the concentration of combustible gases or vapors in the sample. *This scale is graduated in per cent of the lower explosive limit.*

For example, if methane alone were present in the sample and the scale pointer read 50 per cent, then 2½ per cent of methane by volume is present in the atmosphere being tested, because the lower explosive limit of methane is 5 per cent by volume with air. (See table I). Such a concentration of methane or of any explosive mixture would be a hazardous condition, and the structure should be ventilated and re-tested before entering. Unsafe atmospheres are indicated in red on the scales of most combustible gas indicators. In general, readings higher than 20 per cent of the lower explosive limit should be considered as hazardous.

These instruments are used in the outside air, only the sampling hose being lowered into the manhole or other underground structure. Samples of the atmosphere under test are brought to the instrument by means of an aspirator bulb. Most explosimeter models are calibrated for petroleum vapors. Although deflections of the scale pointer will, therefore, not accurately measure the per cent of other gases or vapors, such calibration permits the instrument to detect practically any combustible gas or vapor, regardless of composition, to a degree of accuracy adequate for insuring complete safety of personnel.

Charcoal absorption tubes are available for attachment to some models to differentiate between natural gas (methane and ethane in particular) and petroleum vapors. With the charcoal tubes, petroleum vapors are absorbed.

Testing for Hydrogen Sulphide

1. Lead acetate ampoules. (Figs. 3 and 4 showing carbon monoxide ampoules and their accompanying color chart are of similar appearance and are used in a similar manner to the hydrogen sulphide lead acetate ampoules described here). Lead acetate ampoules are sold in boxes, each containing 10 ampoules, for about $1.50.

In use, the ampoule is crushed with the fingers to obtain uniform saturation of the cotton covering and is then suspended for one minute from a cord in the underground structure at the approximate height of a man's head. If hydrogen sulphide is present, the cotton will turn yellow or brown in color. The color obtained is compared at once with the color chart provided. Gas concentrations from 5 to 25 ppm are indicated on the chart. The necessary precautions are given on the chart. When a hazardous amount of hydrogen sulphide is detected, the structure must be ventilated and the test repeated before men enter.

2. Lead acetate solution. A piece of cotton or filter paper may be moistened with a 5 per cent (by weight) solution of lead acetate and exposed for about 5 minutes to the atmosphere under test. A color varying from yellow through brown will indicate very low concentrations of the gas. If the cotton or paper is colorless no hydrogen sulphide is present. The test is qualitative. While this lead acetate solution may be procured for a few cents, the ampoule method is easier to perform in the field and gives a quantitative measurement of the gas concentration. The ampoule test is therefore preferred to the solution test.

Testing for Carbon Monoxide

Carbon monoxide ampoules afford the cheapest method of detecting this gas. (See Figs. 3 and 4.) They are sold in boxes of 10 ampoules for about $1.25.

These ampoules utilize a chemical solution containing palladium chlo-

Fig. 5—OXYGEN deficiency indicator in use
Aspirator bulb (in right hand of operator) brings sewer atmosphere sample to the flame.

ride. When the ampoule is crushed, the solution is absorbed by the cotton covering and darkens on exposure to carbon monoxide. The color varies from yellow to dark grey. A scale of comparative colors is provided, giving the gas concentration to 0.1 per cent by volume. The necessary precautions are given on the chart.

These ampoules are suspended in the same manner as hydrogen sulphide ampoules but are exposed in the underground structure for at least 10 minutes. In temperatures below freezing, the period of exposure should be at least 20 minutes. Whenever hazardous amounts of this gas are detected, the structure must be thoroughly ventilated and the test repeated before men enter.

Testing for Oxygen Deficiency

Tests for oxygen deficiency should be made with an oxygen deficiency indicator. (See Fig. 5). This is an adaptation of the flame safety lamp used by miners *but it is not the same thing. A miner's safety lamp or an oxygen deficiency indicator should never be lowered into an underground structure, such as a sewer, where hydrogen may be present.*

A sample of the atmosphere under test should be aspirated into contact with the flame of an oxygen deficiency indicator through a sampling hose and intake tube, the latter being equipped with a flashback arrester capable of preventing the propagation of a hydrogen flame. Hydrogen, a constituent of manufactured gas, can propagate through the gauges of either a flame safety lamp or oxygen deficiency indicator, possibly causing a serious explosion. Furthermore good practice is away from the use of any open flame in a suspected gas atmosphere, for there is always a possibility that a flame safety lamp or oxygen deficiency indicator may be defective or improperly assembled.

The use of oxygen deficiency indictators eliminates the necessity of placing a flame in a questionable atmosphere and affords a means whereby the flame is readily visible at the surface to the observer.

An oxygen deficiency is indicated with an oxygen deficiency indicator by a decrease or extinguishing of the flame, except where a combustible gas is also present, when a sustained increase in flame height may be accompanied by dimming of the flame.

If an explosive amount of flammable gas is present, the flame will flare up and then be extinguished. The flame will usually be extinguished by an atmosphere containing less than 16 per cent of oxygen, and always by one below 13 per cent of oxygen and it is therefore a safe indicator of oxygen deficiency.

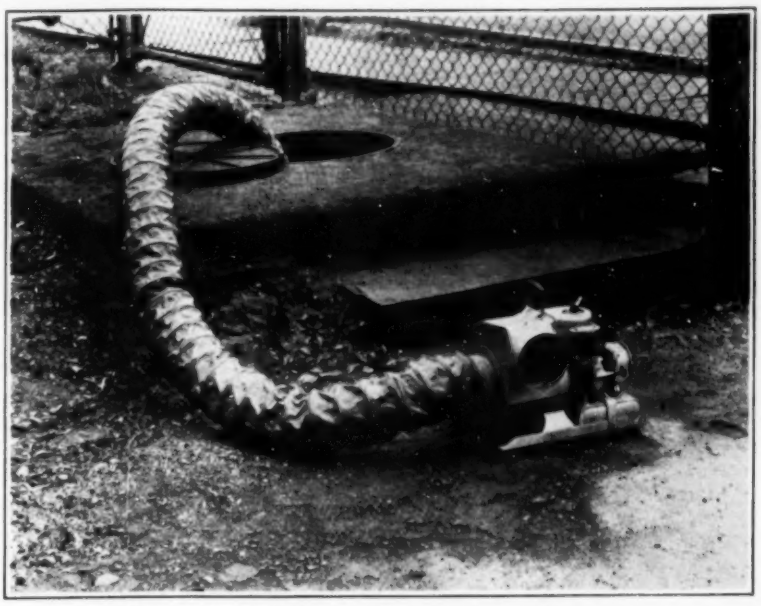


Fig. 6—AIR BLOWER, a portable gasoline operated type
This provides effective sewer ventilation.

At elevations over 5000 feet above sea level the flame may continue to burn in atmospheres dangerous to life. This possibility must therefore be considered in high altitudes.

Oxygen deficiency indicators sell for about $30. In addition to detecting explosive amounts of flammable gases and oxygen deficiency, these devices also detect dangerous concentrations of gases such as nitrogen and carbon dioxide by virtue of the latter's action in mechanically excluding oxygen. To the trained observer the flame of an oxygen deficiency indicator will also detect about 0.7 per cent of gasoline vapor, this percentage being about 50 per cent of the lower explosive limit of gasoline. It will also detect, by means of a characteristic blue cap of flame superimposed on the yellow flame of the lamp, methane in concentrations from 1 per cent to 5 per cent by volume. (At 5% by volume, methane will explode).

Careful observation and training is required, however, before reliance can be placed on such tests for gasoline or methane. For these reasons a combustible gas indicator should be used *before* making tests with the oxygen deficiency indicator.

To save time in testing, the carbon monoxide test with ampoules can be made while testing for oxygen deficiency.

The question is frequently asked—Why not use canaries as a test for oxygen deficiency? These birds, or any small animal, are not a reliable or safe means for detection because the birds may continue to live in an atmosphere so deficient in oxygen as to be fatal to human beings. Canaries are also unreliable for detecting carbon monoxide unless several birds whose histories are known and who have not been exposed repeatedly to carbon monoxide are used.

For further information on the use of small animals the reader is referred to "Mine Gases and Methods for Their Detection", Miners' Circular 33, U.S. Dept. of the Interior, Bureau of Mines. For sale by the Superintendent of Documents, Washington 25, D.C., 30 cents. This circular also has much useful information on gas characteristics, use of safety lamps, detecting methane with safety lamps, etc.

Detecting Gases by Odor

Manufactured fuel gas and natural gas intended for industrial or home use usually contain an artificially introduced odor. This odor should not, however, be depended upon as a means of detection in sewers because of the possibility of the odor-producing substance being filtered out or diluted in the passage of these gases through soil. As little as 6 inches of moist soil might filter out the detecting odor.

The odor of gasoline is noticeable in concentrations as low as 0.03 per cent by volume with air. If the atmosphere of an underground structure is carefully sniffed at ground level, the sense of smell will therefore sometimes be a indication of its presence. The lower explosive limit of gasoline is not reached until 1.3 per cent by volume with air has accumulated, and man can tolerate about 0.1

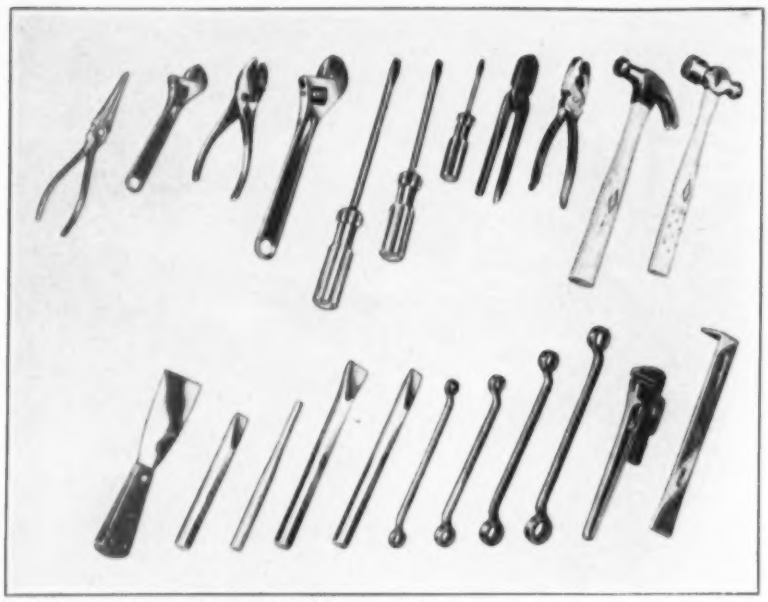


Fig. 7—SAFETY TOOLS, non-sparking beryllium-copper alloy
In atmospheres containing flammable gas these are safe to use.

per cent for an hour's exposure without serious disturbances. However, since heavy concentrations of gasoline vapor have rapid anesthetic effects when inhaled and since gasoline vapor has a specific gravity of 3.0 to 4.0 and may therefore be concentrated in the bottom of structures, the recommended safe procedure for testing is by means of a combustible gas indicator as previously described.

Hydrogen sulphide gas has a typical rotten-egg odor, but only in small concentrations. As little as 2 minutes exposure to 0.01 per cent of hydrogen sulphide by volume with air impairs the sense of smell. At high concentrations the odor is not evident at all to human beings. The sense of smell cannot therefore be depended upon for its detection.

Methane, carbon dioxide, nitrogen, carbon monoxide, hydrogen and ethane are all odorless. Likewise oxygen deficiency cannot be detected by odor. The tests previously described must be used to detect these gases.

As previously mentioned, a few gases, which might be occasionally encountered, may be reliably detected by odor. These include chlorine, sulphur dioxide and ammonia.

Why Not Ventilate Structures and Forget the Tests?

At first thought this idea might appear logical. The source of noxious gases or vapors or oxygen deficiency may, however, be a persistent one of major proportions.

For example, leakage of manufactured fuel gas into a sewer from a broken gas main will *continue* to contaminate the atmosphere of a sewer until the leak is stopped. Initial or even continuous ventilation of a sewer under such a condition cannot be considered a substitute for testing.

Admittedly, thorough ventilation of all underground structures before entering and the wearing of safety belts by workers would have saved many of the lives formerly lost in sewers, but such steps are not absolute. Tests for noxious gases and oxygen deficiency must be made.

Summary of Procedure for Detection of Noxious Gases or Vapors and Oxygen Deficiency

1. Test for flammable or explosive gases or vapors with a portable combustible gas indicator.
2. Test for hydrogen sulphide gas with hydrogen sulphide ampoules.
3. Test for carbon monoxide gas with carbon monoxide ampoules.
4. Test for oxygen deficiency with an oxygen deficiency indicator *(not a safety lamp)*.
5. Observe any foreign odor or irritation to the eyes.

DO—Make All the Above Tests.
DON'T—Depend on the Sense of Smell Alone.
Use Canaries for Testing
Expect that Ventilation will Necessarily Make an Atmosphere Safe.
Trust to Luck.

Summary of Safe Practices for Work in Sewers

Condition I: Tests show no noxious gases or vapors, and sufficient oxygen is present to support life.

Workmen entering sewers over 8 feet deep will don safety belts. TWO men will be available at the top for removal of a workman. Even though the tests have shown no dangerous atmospheric conditions, there is always the possibility of a change in such conditions, or a physical injury may occur necessitating the use of a safety belt.

No smoking will be allowed. Sparks from tools will be prevented. Rubbers will be worn on the feet. Only approved safety hand lamps, mirrors or safety head cap lamps will be used for illumination.

If the workmen are to be subjected to long exposure in the sewers, the tests for gases and oxygen deficiency will be periodically repeated.

Condition II: Tests show noxious gases or vapors or oxygen deficiency.

Extreme care will be exercised to avoid sources of ignition if flammable gas is detected. The structure will be thoroughly ventilated and the tests then repeated. Ventilation may be secured by the following methods:

1. A canvas canopy may be set windward over the open manhole shaft with adjacent upstream and downstream manholes also open to help in air circulation. This is fairly effective with moderate to strong winds.
2. A water stream from a fire hose directed into the manhole will sometimes create enough draft to ventilate the structure. Adjacent manholes should be open.
3. Compressed air from a portable air compressor is very effective for ventilation. The air pipe should extend to near the bottom of the structure.
4. A portable air blower driven by an electric or gasoline motor is another effective method for ventilation. (See Fig. 6).

The discharge hose should extend well into the manhole shaft. These blowers should be furnished with vapor-proof, totally enclosed motors or non-sparking gas engines; otherwise special precautions must be taken that they do not serve as a source of ignition for flammable gas. Such precautions include placing the blower on the leeward side of the manhole and at least 6 feet from the opening.

Following thorough ventilation the tests are repeated and when the atmosphere in the manhole is safe, work may proceed as in Condition I. However, since a dangerous condition initially existed, tests for noxious gases or oxygen deficiency should be repeated frequently while work progresses.

Condition III: Tests show noxious gases or vapors or oxygen deficiency, and an emergency exists.

For example, a large sewer may contain a stoppage which is causing extensive flooding of property or a workman may have been overcome in a manhole. In the latter case it is quite obvious that the proper tests were not made, and under such circumstances it must be assumed that a hazardous condition exists in the manhole.

Men entering the sewer under these conditions will don safety belts, wear rubbers, use only approved safety lighting, and be equipped with the proper respiratory-protective apparatus. Respiratory-protective equipment is fully discussed in the next section. If tools are needed for emergency jobs in flammable gas atmospheres, non-sparking beryllium-copper alloy tools should be used. (See Fig. 7). Great care must be exercised to avoid all sources of ignition including those of static origin. *Work progressing in flammable gas atmospheres is extremely hazardous and must never be attempted except by those fully aware of the dangers.*

Acknowlegments for photos

Figures 8, 9, 10, 11 & 12 were supplied by Mine Safety Appliances Co., Pittsburgh, Pa.

Figure 13 was supplied by Homelite Corp., Port Chester, N.Y.

Figure 14 was supplied by Ampco Metal, Inc., Milwaukee, Wis.

To be continued.

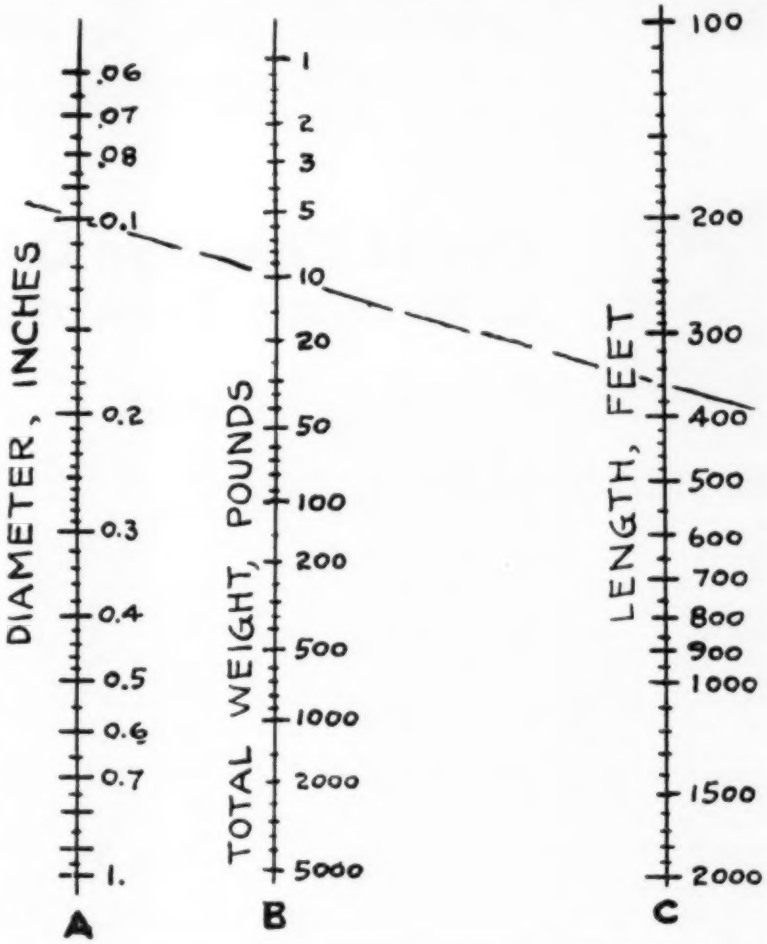
Coils of Steel Wire, Weight or Length of Rods, etc.

Here is a simple chart that immediately gives you the weight of any length or diameter of steel wire, steel rod, welding rod, etc. Thus for example if the diameter of the wire is 0.1 inch (See column A) and the length of the wire is 360 ft. (See column C), a straight line drawn through those two points as indicated by the dotted line cuts column B at a point a trifle less than 10. In other words, Column B tells us that the weight of the wire is close to 10 pounds.

If the wire is only 36 feet long instead of 360 feet the weight would be one tenth that for 360 ft.—namely, one pound instead of 10 pounds.

Since column A varies all the way from 0.06 inch to one inch in diameter and column C varies from 100 ft. to 2,000 ft., it is obvious that the chart will take care of almost any combination of diameters and lengths.

If the weight in a coil is known or can be determined, the length of wire can be obtained by extending the line from A to B through to C—the length scale.



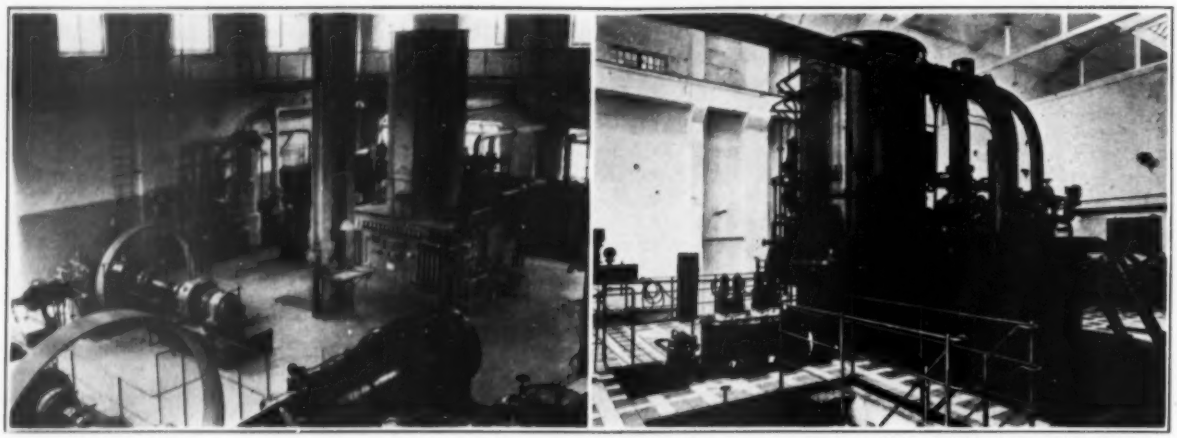
Survey Planned to Save Fresh Water Now Lost in San Francisco Bay

According to the New York Times, California State and Federal governments are expected to embark soon on separate comprehensive studies of water resources and San Francisco Bay problems generally at a cost that may run up to $4,000,000.

The survey would take up the questions of consuming the huge quantities of fresh water that pour through the Golden Gate to the sea—water that might be diverted to agricultural and industrial use—and the building of salt water barriers across the bay to create two great fresh water lakes.

The full survey would include consideration of dikes, or barriers across the north and south parts of the bay which can be used to conserve fresh water, and also involves highways and railroads.

The salt water barriers are key features of the Reber Plan, which has been defended and fought in and out of legislative committees for more than a decade. Its name comes from John Reber, a former theatrical stage manager, who has given hundreds of speeches for what has been variously described as "the greatest project ever conceived" and as "a fantastic, illadvised program."



Courtesy of Chemical Plants Div., Blaw-Knox Co.

Fig. 1—INDOOR TONNAGE OXYGEN PLANTS of Linde-Fraenkl type
LEFT—Plant of 25 tons per day capacity. Compressor in foreground, cold box and regenerators in background. RIGHT—Plant of 17.5 tons per day capacity. The operating floor is shown; some equipment extends to floor below.

Use of Tonnage Oxygen in Sewage Treatment

Oxygen Gas of 95% Purity may be the Basis of a New Bio-Precipitation Process

by DANIEL A. OKUN*, *Assoc. Professor of Sanitary Engineering, School of Public Health, Univ. of North Carolina, Chapel Hill, N. C.*

IN presenting a paper having an unfamiliar term in its title, the first order of business should be to explain that term. The title "Use of Oxygen in Sewage Treatment" would not have sufficed because we all know that oxygen, which comprises 21 per cent of air, serves to sustain the microorganisms responsible for sewage treatment by aerobic processes. The title "Use of Pure Oxygen in Sewage Treatment" would not have served because "pure oxygen," usually distributed in steel cylinders under high pressure, has a purity of about 99.8 per cent. The prospect of truck-upon-truck load of cylinders of oxygen gas being handled at a sewage treatment plant is not a pleasant one to contemplate. "Tonnage oxygen" is the relatively new term given to oxygen gas of about 95 per cent purity which is produced at a relatively high rate to be used continuously at or near the site of its production.

The Manufacture of Tonnage Oxygen

Almost all oxygen in the U.S. is manufactured by the liquefaction of air and its subsequent fractional distillation. Nitrogen boils at —195.7° C and oxygen at a higher temperature, —182.5° C, so that in a fractionating column the nitrogen comes off the top, and oxygen off the bottom. The rare gases (neon, argon, krypton and xenon), used extensively in modern lamps, may be taken off the middle of the column.

There has been a sharp drop in the cost of producing tonnage oxygen because of (a) recent improvement in the design of heat exchangers, turbo compressors and turbo expanders, (b) increased size of the installations, (c) utilization of the oxygen as it is produced instead of compressing it in cylinders at high pressures, and (d) savings inherent in producing a lower purity oxygen.

This paper was presented at a joint meeting of the North Carolina Section, A.W.W.A., and the North Carolina Sewage and Industrial Wastes Assn., and has been released for publication in *Water & Sewage Works*.

Applications

Lowered costs have led to the utilization of tonnage oxygen for many industrial processes where pure oxygen had never been able to enter before because of price considerations. These applications include the manufacture of synthesis gas (mixtures of carbon monoxide and hydrogen) from coke and coal for the chemical industry, and the conversion of natural gas to liquid fuel. Incidentally, new plants are now being built which use the oxygen from a tonnage oxygen plant for making hydrogen, and combine the hydrogen with the nitrogen from the same tonnage oxygen plant for the manufacture of ammonia.

Other applications include the underground gasification of coal, where the use of oxygen produces a threefold increase in the heating value of the gas produced. The greatest volume use up to now has been in the metallurgical industry to speed the production of steel in furnaces.

Number of Plants

Most tonnage oxygen plants have been built in Europe, one firm alone having built 78 plants, with an aver-

* Mr. Okun is on leave of absence from Malcolm Pirnie Engineers, New York, N.Y.

age capacity of 60 tons per day each. In the U. S. since 1948, when only experimental units were in operation, about a dozen plants have been built, ranging in size from a 20 ton per day plant in Virginia to a 2000 ton per day unit in Texas. Photographs of indoor tonnage oxygen plants are shown in Fig. 1 and an outdoor installation is shown in Figs. 2 and 3.

Cost of Tonnage Oxygen

These developments have cut the cost of tonnage oxygen to the point where the chemical engineering literature uses another term of description: "cheap oxygen." But because this field is changing so rapidly, and the conditions under which the oxygen is to be used are so different, it has been difficult to arrive at a firm price.

Cost Considerations

The manufacturing cost (not including the high cost of bottling and cylinder handling) of producing oxygen by the classical method is $3.6-4.5 per ton. Published costs for tonnage oxygen by one manufacturer in 1951 ranged from $5.00 per ton for 100 ton per day plants to $8.30 per ton for 25 ton per day plants, all costs included[1]. The variation is due primarily to increased fixed charges and labor costs per unit for the smaller plants. The plant costs, including superstructure, varied from $300,000 for a 25 ton per day plant to $820,000 for a 100 ton per day plant. One other manufacturer has furnished data showing lower costs, and three others slightly higher costs[2].

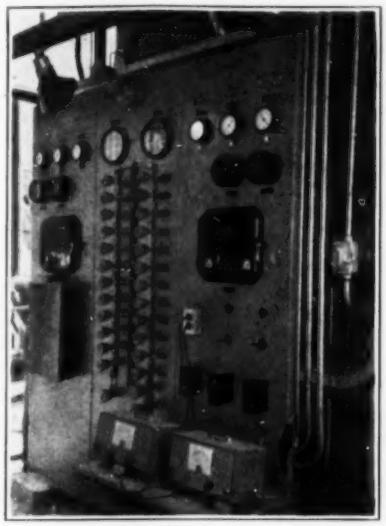
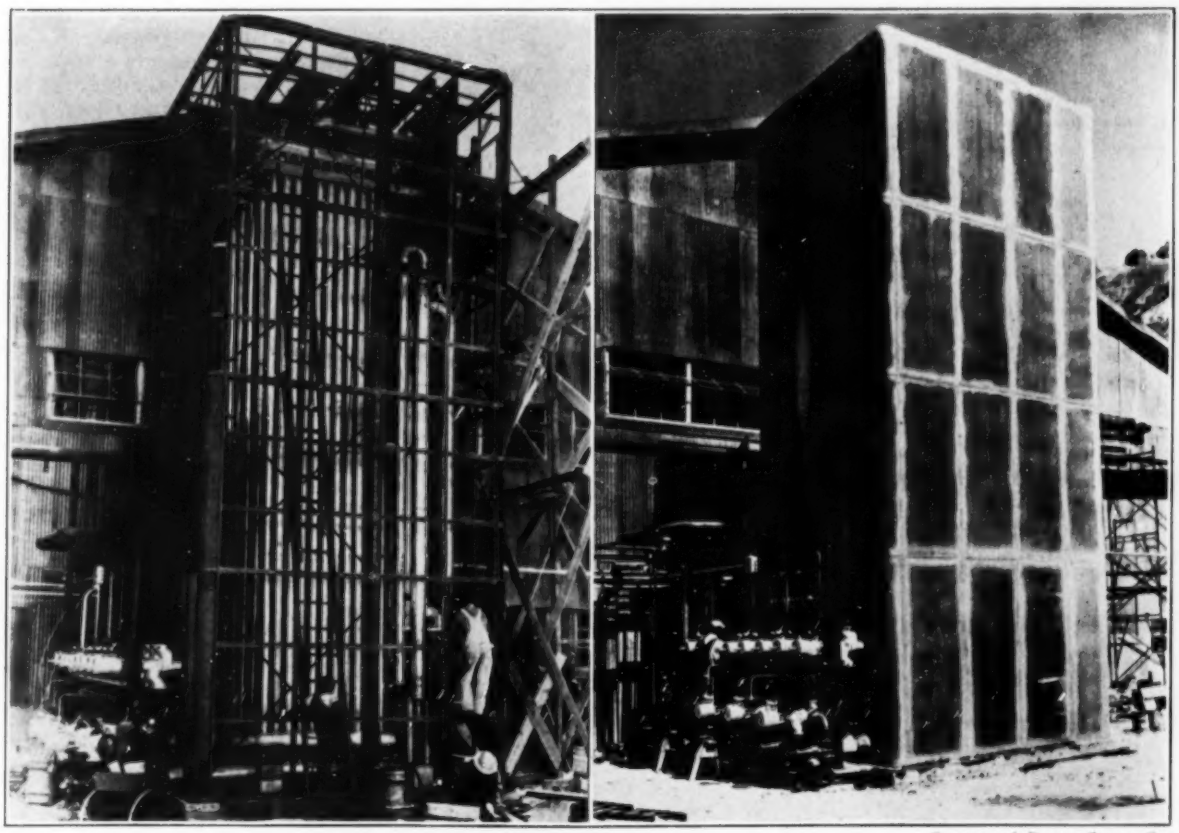


Fig. 3—CONTROL and instrument panel for the outdoor tonnage oxygen plant illustrated in Fig. 2.

Now, why do we speak about tonnage oxygen at any price when the oxygen in the air is free? If I wanted to be humorous I could intimate that the difference is much the same as the difference in pick-up one gets from a shot of 100-proof bonded bourbon whiskey or from a highball. The analogy is apt for oxygen in the metallurgical industry but not particularly in sewage treatment. It has not been proved that oxygen will stimulate the activity of microorganisms in sewage to a substantially greater extent than air, and much work needs to be done in this area.

The essence of the advantage in using tonnage oxygen for a biological purpose lies in the solubility of oxygen. The oxygen concentration in sewage at normal temperatures and pressures is only about 8 ppm when fully saturated and exposed to air. No amount of additional aeration will increase this concentration. But when



Courtesy of Dresser-Stacey Co.

Fig. 2—AN OUTDOOR TONNAGE OXYGEN PLANT of 25 tons per day capacity

LEFT—This shows the heat exchangers before insulation and protective sheet metal covering is added. RIGHT—Completed outdoor units. Compressors, water coolers, and chiller are located in building in background.

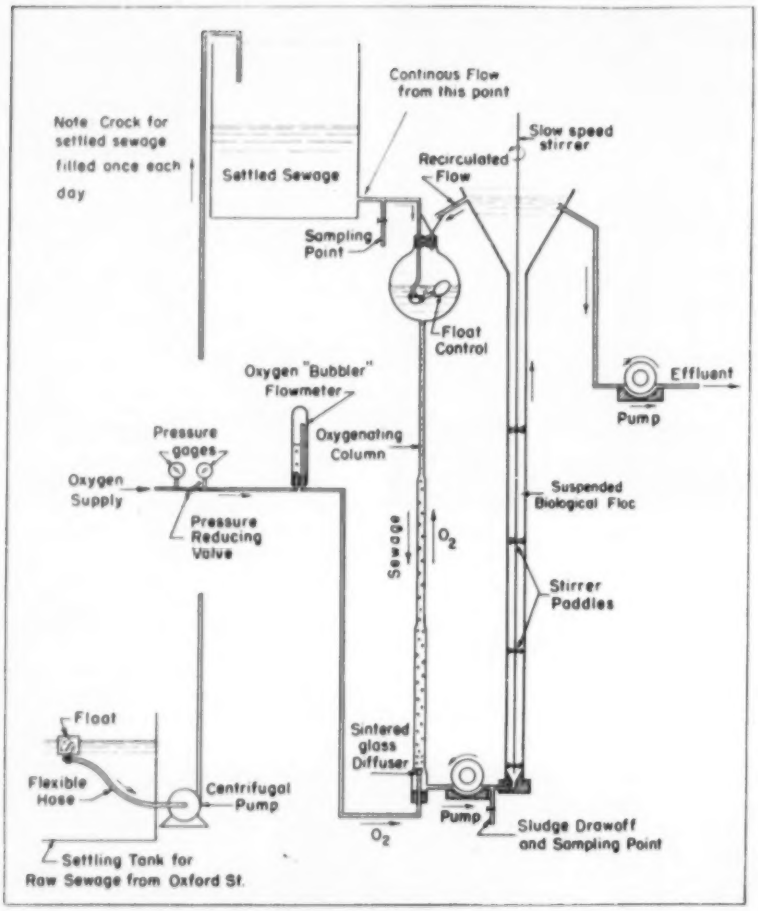


Fig. 4—BIO-PRECIPITATION laboratory equipment
This illustrates flow in a continuous pilot plant set-up.

sewage is in contact with oxygen, the solubility at saturation increases five-fold—to about 40 ppm. And under a hydrostatic head of 17 feet, the concentration at saturation increases to 60 ppm. Saturating sewage with oxygen in a tank will provide *at one contact* much of the oxygen required to satisfy the biochemical oxygen demand of the sewage.

Biological Treatment of Sewage

Now that we know something about tonnage oxygen, let us discuss its possible role in sewage treatment. In assessing a new idea it is always helpful to get an historical perspective of its field of application.

The problem of disposal of human excreta is certainly as old as any of the problems of humankind, but the first investigations of sewage treatment methods were made only a century ago. In London, during the middle of the last century, an historian of the period recorded:

"Never before had a stink arisen to the height of an historic event. . . . 'India is in revolt and the Thames stinks'. (These) two great facts coupled together marked the climax of a national humiliation."

It is to the credit of the sanitary engineering profession that the causes of the latter complaint were more quickly corrected!

As a result of this humiliation, the Royal Commissioners on Metropolitan Sewerage Discharge (London), in their reports of 1858 and 1865, proposed sewage disposal by "broad irrigation" and "intermittant filtration." It was not until the turn of the century that another major step forward was taken. Stimulated by the development of the germ theory, and by proof at the Lawrence Experiment Station that filtration is a biological rather than a straining process, the trickling filter was developed.

Activated Sludge Treatment

The activated sludge process, still the most efficient method for the high-degree treatment of sewage, was first hit upon in 1912. Since the development and wide adoption of the activated sludge process, there have been no major improvements in the methods of sewage treatment. It is true that several different types of "high-rate" treatments have been successful, but these have generally been associated with a poorer degree of treatment than that of the standard trickling filter or activated sludge process. They have, however, filled a gap in the sewage treatment field by providing a degree of treatment intermediate between plain sedimentation and complete biological treatment. Also there have been impressive improvements in the mechanical equipment available for sewage treatment.

But it appears that in the century since sewage treatment was first investigated, the major advances in the complete treatment of sewage took place in the first sixty years, and no fundamental changes have been recorded since. In an era of television, jet-propulsion, nuclear fission, an absence of qualitative improvement in sewage treatment practice is surprising indeed.

Need for New Methods

This is not to say that the use of oxygen in sewage treatment will be that major development, long overdue, but rather that we should not be content only to improve our techniques; we should be casting forth for new ideas, new techniques, and new tools.

One new idea that is receiving considerable promotion today is represented by the sale of microorganisms and their enzymes to be added to sewage treatment units to improve their efficiency. This idea may have merit, and perhaps one day that organism will be developed which will hydrolize all the solids and eliminate the sludge disposal problem. But, so far as improving the efficiency of a biologic treatment process is concerned, our aim should be to create so happy an environment for the microorganisms responsible for the aerobic treatment of sewage that they will multiply at a rapid rate—in which case only one organism of each of the myriad species would need to be present at the beginning. It is in the area of improving the environment of these microorganisms that tonnage oxygen can be useful.

Tonnage Oxygen Applied To Sewage Treatment

The microorganisms associated with the activated sludge floc in standard treatment plants go through cycles of feast and famine: feats, when they are introduced to the influent sewage and get their first charge of food and oxygen; famine, when the sludge

passes to the final settling tanks where fresh food is no longer provided and where the slight reserves of oxygen in the sludge are rapidly depleted; then feast again, when the sludge is returned to the tank influent.

The injuries done the microorganisms are often apparent, with symptoms such as sludge bulking and impaired purification capacity of the returned sludge. Even slight septicity of the returned sludge seriously reduces the activity of the effective organisms[3].

Tonnage oxygen can help in this situation, but not simply by replacing air with oxygen in standard units as has been attempted by Viehl[4]. This use is wasteful of oxygen because we know that a large part of the air applied in aeration tanks escapes at the surface. Nor is it feasible to recapture this oxygen, since, as Babbitt[5] found, the gas escaping at the surface is fouled with nitrogen washed out of the sewage. Raising the D.O. of the mixed liquor to supersaturation with respect to air is also wasteful, since the supersaturated oxygen will escape from the plant dissolved in the effluent and thus gradually pass to the atmosphere.

Bio-Precipitation

New tools require new techniques. A basically new process was devised for making economical use of tonnage oxygen in biological sewage treatment. This has been called bio-precipitation[6]. A flow chart of a continuous-flow laboratory pilot plant is shown in Fig. 4, and a photograph of two plants, operated in parallel for research purposes, is shown in Fig. 5.

Laboratory Process

In the laboratory procedure, sewage is pumped from a street sewer adjacent to the laboratory into a tank in the basement, where it is allowed to settle. The settled sewage is pumped into crocks from which it is fed continuously to the plant. The sewage flows into the reservoir, where the level is maintained constant by float control.

The sewage then flows down the oxygenating tube, where oxygen bubbles, fed through a sintered glass diffuser, move upward counter-current to the sewage. Oxygenated sewage is then pumped into the bottom of the precipitation tube, which contains the suspended biological floc. The effluent is collected from the top of the apparatus.

Effluent is recirculated as required to carry sufficient oxygen to the floc for the process. The recirculated flow is taken from the top of the tube for ease of control, although it could be taken at a lower level, reducing the overflow rate. A slow-speed stirrer was found to be necessary to keep the suspended floc from coalescing into large particles which would settle and also to prevent short-circuiting. Flow rates and oxygen applications are adjusted to keep the floc in suspension in the precipitation unit and to maintain dissolved oxygen in the effluent just equal to saturation with respect to air.

New Ideas

The bio-precipitation process overcomes some of the disadvantages of the activated sludge process by embodying four new ideas:

(1) Oxygen for maintaining aerobic conditions is supplied by pre-oxygenating the liquid to be treated and using the liquid itself as a "carrier" of this essential element. No air is blown through the floc.

(2) In order to supply the oxygen needs of the biological floc from the influent liquid, tonnage oxygen is used.

(3) The tank contents are not circulated and there is no turbulence as in the activated sludge process. The biological floc is kept in suspension by the gentle upward flow of the sewage being treated.

(4) Final sedimentation tanks for the separation of the sludge from the treated sewage, as in the activated sludge process, are not required. Sludge flocs remain continuously aerobic and in contact with the sewage until they are wasted.

Because of this more "sympathetic" treatment of the biological floc, and because more floc can be maintained in a given space than in the activated sludge process, it is reasonable to expect better purification per unit of tank volume with the bio-precipitation process. That this is the case is seen in Fig. 6, where the results of the experimental work are plotted. These experimental data have been reported in the literature[7].

In comparison with the curve suggested by Greeley[8] in 1943 for the purifications obtained with different loadings in high-rate activated sludge plants, the results obtained in the bio-precipitation experiments show that for an equal degree of purification, the

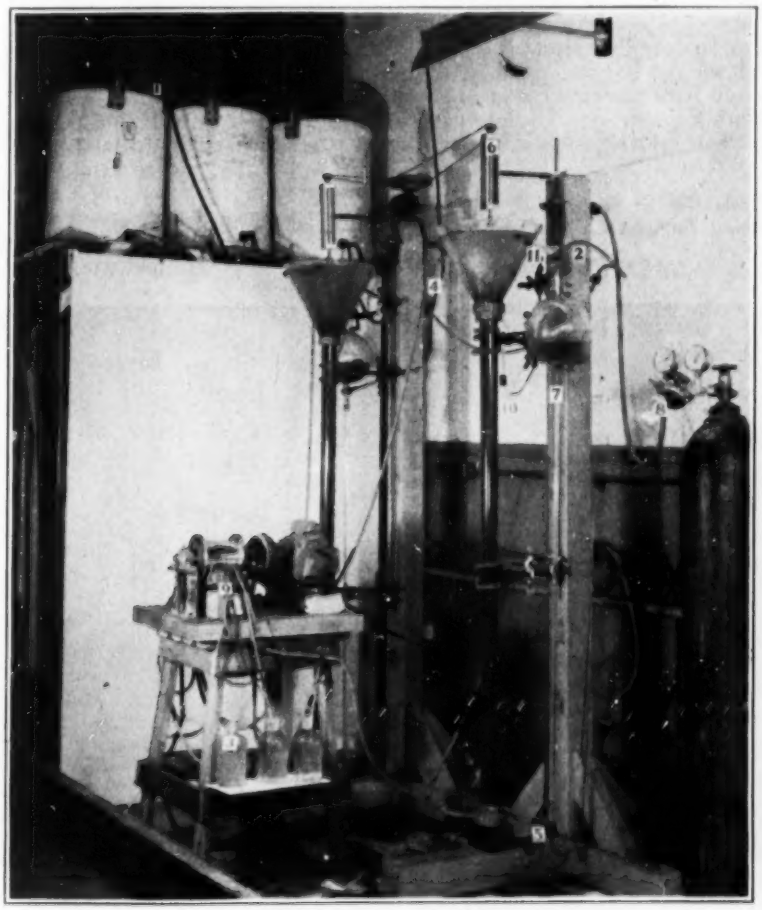


Fig. 5—EXPERIMENTAL bio-precipitation units
Air used to operate plant on left; oxygen used in plant on right.

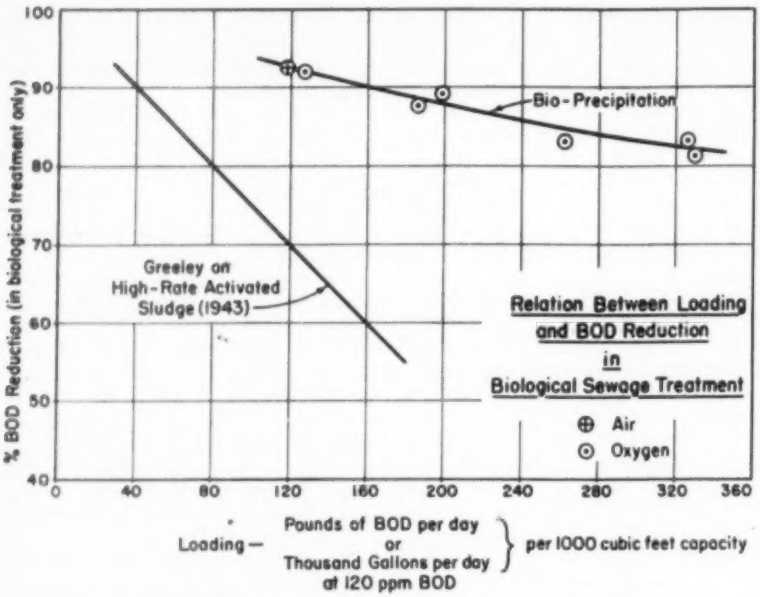


Fig. 6—COMPARISON of high-rate activated sludge and bio-precipitation

bio-precipitation process can be loaded about four times more heavily than the conventional activated sludge process. In other words, for the same quantity of sewage treated, about one-quarter of the plant is required. Shown also are the results of a run made with air rather than oxygen. With air, only very low loadings are possible, with necessarily high recirculation rates.

Evaluation of Results Using Tonnage Oxygen

The experimental work indicated that, if 50 per cent of the oxygen applied were lost, about one ton of oxygen would be required for complete treatment of one million gallons of sewage. With costs of oxygen at the figures indicated earlier in the paper ($5.00-$8.30 per ton), tonnage oxygen is competitive with compressing air in standard activated sludge plants. Also a plant cost of $300,000 for a 25 ton per day oxygen plant would amount to a capital cost of $12,000 per million gallons of treatment plant, which is reasonable, particularly in light of the very significant savings that may be possible in tank construction cost.

The investigations here reported, in addition to evaluating the use of commercially pure oxygen in biological sewage treatment, were intended to assess the importance of factors that influence biological treatment in general. These factors include the oxygen concentration, amount of biological floc in the system, degree of loading of the system, the effect of some industrial waste components on the treatment, etc. The influence of these factors also has been reported in the literature[7].

Photomicrographs of the bacteria, protozoa and fungi responsible for the purification of the sewage are of value as indicators in judging the suitability of the environment. Fig. 7 shows a floc particle taken from the bio-precipitation unit while treating normal sewage. Fig. 8 shows the nature of the floc when a sugar-rich sewage was fed. Sewage high in carbohydrates stimulates the growth of the filamentous organism, *Sphaerotilus*, usually associated with a bulking sludge. In the bio-precipitation type of unit, the development of this filamentous growth causes no difficulty, because there is no vigorous agitation to break up the filaments and render them difficult to settle.

In conclusion, it appears that the adaptation of tonnage oxygen to sewage treatment is feasible and that it may prove to be economical. We will be in a better position to assess the

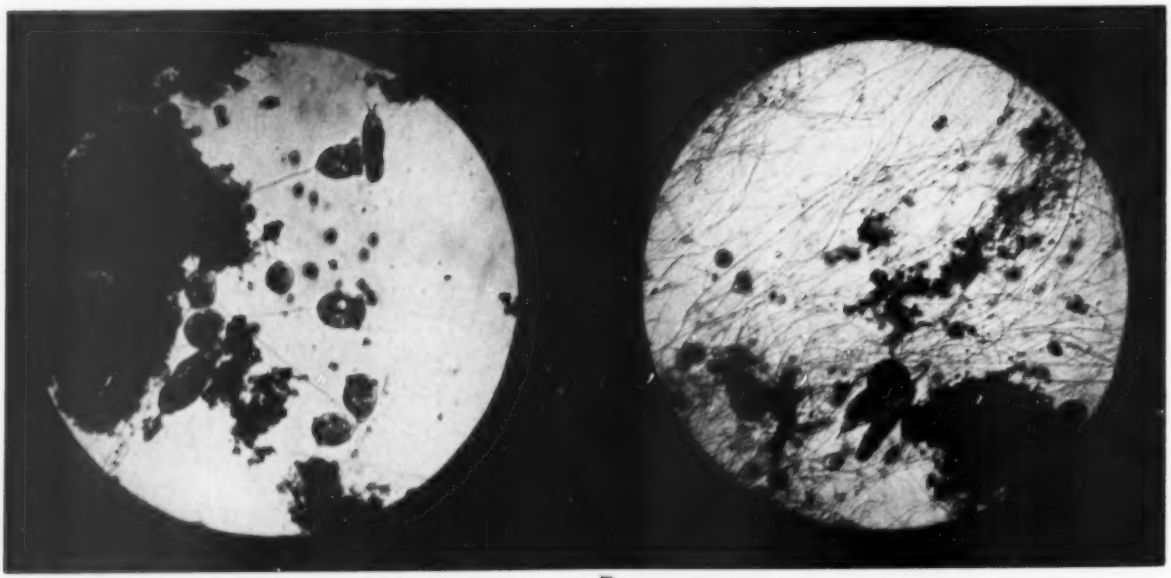


Fig. 7—PHOTOMICROGRAPHS of sewage in process of purification by bio-precipitation

LEFT—Normal sewage floc and microorganisms at work. RIGHT—Sewage high in carbohydrates stimulates growth of filamentous organisms.

value of tonnage oxygen in sewage treatment when data are available from full scale pilot plant operation.

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6. D. A. Okun, "Pure Oxygen in the Bio-Precipitation Process May Reduce Sewage Treatment Costs," Civil Eng., 18, 288 (1948).
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8. S. A. Greeley, "High Rate Biological Sewage Treatment," Sewage Works Jour., 15, 1062 (1943).

"Shades of Satan"

Imagine the surprise of meter-reader Don Hack, of the Indianapolis Water Co., when lifting the lid of one of Ford Co.'s locktight meter boxes to come face to face with a snake. As a caption for the picture all we could think of was "Shades of Satan."

This experience of Don Hack caused Johnny Kleinhenz, publicity director for Indianapolis Water Co., to break forth in "Water Lines" with the following verse. Name the meter if you can—no not the meter in the picture.

A METER READER'S
"ODD-I-SEE"

We've heard about the perils
That meter readers meet.
Some are dogs with teeth so sharp
That they remove the seat;
Some are steps so wobbly
That the reader takes a fall;
Again there are the flue pipes
That bean a guy who's tall.
But now we have a new one—
Perhaps it is the worst.
What happens if you meet a snake
When only water's quenched your thirst?

Preparing Steel Surfaces for Coatings

A Report by Assn. of Corrosion Engr's.

The National Association of Corrosion Engineers has published its second interim report dealing with methods of preparing steel surfaces for coatings. This report, titled "Report on Surface Preparation of Steels for Organic and Other Protective Coatings," is designated Publication 53-1 by NACE.

The report covers recommendations and explains methods whereby the surfaces of steel may be prepared for painting with organic and other coatings by means of weathering, wire brushing, grinding, flame conditioning, nozzle blast cleaning both wet and dry, wheel blasting, chemical pickling, electrolytic pickling, surface conditioning and numerous other related methods. Accepted standards are discussed and safety measures indicated.

Copies of the report (13 page reprint) are available at $1 each, or 5 or more copies at 50 cents per copy. Order from the Association at 1061 M&M Bldg., Houston, Texas.

To Produce B-12 Vitamin from Milwaukee Sewage

According to a report in the Wall Street Journal, a Chicago Engineering firm has signed a contract with the Milwaukee City Sewerage Commission, to produce Vitamin B-12 from Milorganite. The vitamin will be used to fortify animal and poultry feed.

Under this contract, the firm is to install a pilot plant to process 40 to 90 tons of Milorganite, demonstrate the B-12 to potential customers, and make a market survey. One year will be allowed for the firm to decide whether to build a million dollar extraction plant near the sewage treatment plant.

Milwaukee has been in the fertilizer business for about 30 years. Twenty years ago, University of Wisconsin scientists discovered that the fertilizer contained elements which speed up animal and chicken growth. In 1952, the Miner Laboratory of Chicago reported discovery of the B-12 Vitamin in the sludge.

Want to Fail?

Sure formula for failure—just try to please everyone you meet.

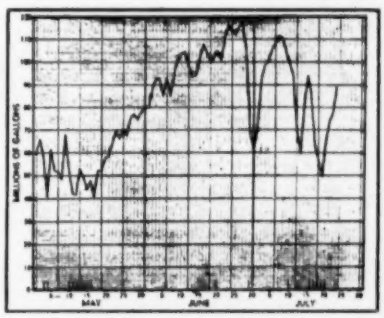


Chart by Supt. Hoefle

Dallas Water Supply Is Low —But Use Sets Record High

Dallas people used more water in June than in any other June in the city's history—nine million gallons a day more than in June last year, and at regular winter rates instead of summer rates as in 1952.

The June consumption totalled 2,956,550,000 gallons, an average of 98,551,000 gallons a day, compared with 58,790,000 a day in May this year and 89,542,000 gallons a day in June, 1952.

According to a story in the *Dallas Morning News*, Water Supt. Karl F. Hoefle came up with some figures and a chart to answer the complaint: "I just couldn't have used that much water."

The complaint has been lodged by numerous water customers startled by their water bills for June.

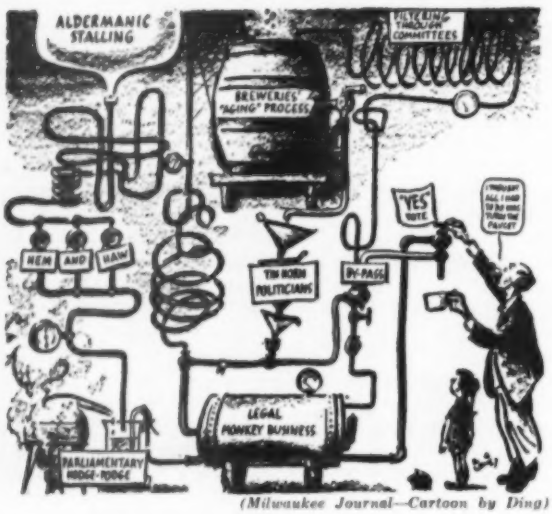
"I don't say that the persons who made the complaint used the water, but somebody certainly did," Hoefle said.

There were only two days in June, the last two, on which Dallas used as little water as on the highest use day in May.

May's biggest use day was the thirtieth, when the city consumed eighty million gallons. From then on, the use see-sawed upward through June to a peak of 118,000,000 gallons on June 27. Then it plunged to 61,000,000 gallons June 30, after rain on the twenty-ninth.

July's consumption chart, has high peaks and deep valleys caused by a few rains and cloudy days.

THE EDITOR'S COMMENTS



(Milwaukee Journal—Cartoon by Ding)

ALL THIS—While Milwaukee's children were denied fluoridated water.

The Will of the People Can't be Blocked for Long

On July 22nd we received a telegram from Edw. F. Tanghe, Supt. of Water at Milwaukee, which stated, "Started adding fluoride to our water at noon today." It was hard to believe.

After nearly five years of political pulling and pushing; decisions and cancellation of decisions; buck passing; introducing legal confusion; ignoring the will of the people, who had voted for fluoridation by a 3 to 2 majority, the anti-fluoridation block in the City Council of Milwaukee has finally been driven into a corner. There remained no recourse other than to order that fluoride treatment of the water be started.

As far back as November 1948, fluoride treatment of the water was recommended by Dr. E. R. Krumbiegel, long-time Health Commissioner of Milwaukee, and endorsed by the State Health Authorities. After two years of haggling over costs, etc., purchase of fluoridating equipment and a supply of silico-fluoride was ordered by the Council in October 1950. More delaying actions followed and the equipment was not installed until nearly a year later. Then came the organized objection by Milwaukee beer-makers that resulted in the "stop order" issued by the City Council which blocked fluoridation until July 22nd last.

After kicking the issue around during the interim the Council decided that the citizens should have opportunity to vote their choice of fluoridation or no fluoridation. The referendum on April 7, 1953, resulted in a sizeable vote of 93,279 for and 58,665 against fluoridation —a 3 to 2 margin in favor of the treatment. Citizens then expected fluoridated water promptly—but, not so. The Council (and beer-makers) weren't licked so easily, for the governing body was quick to repudiate its declared intention to let the people decide. It was at this juncture that the *Milwaukee Journal*, a staunch supporter of fluoride treatment, could stand no more and let go with editorial blasts and the expressive cartoon by Ding, which is here reproduced.

One Council maneuver was that of asking for an opinion from the Attorney-General as to the constitutionality of fluoridation. In due time the opinion rendered was that fluoridation of public water supplies is legal. Cited, were the findings of the National Institute of Municipal Law Officers which, after an extensive study of the aspects of water fluoridation, has concluded that "fluoridation can not be considered an unconstitutional invasion of the right of religious freedom" . . . "it is a constitutionally permissible exercise of municipal police power." It was this decision that gave the fluoridation proponents on the Milwaukee Council their opportunity to put through the resolution ordering that fluoridation be started July 22nd, almost five years after its recommendation by the local and state health authorities.

Hardly had fluoridation gotten under way, however, when the Utilities Committee of the Council met and put through a resolution, passed by a thin 15 to 12 vote, which would have stopped fluoridation pending the result of a proposed questionnaire survey of the medical fraternity of the County. Since such a survey had earlier been made, this resolution was quick to be vetoed by Mayor Frank Zeidler out of respect for the will of the people. Since it is highly improbable that the 18 votes required to over-ride the mayor's veto can be obtained, it appears that fluoridation is at long-last in to stay at Milwaukee—the beer-makers notwithstanding.

As we said at the beginning of this statement—*"The will of the people can't be blocked for long."* In the case of Milwaukee it is our impression that the will of the people was blocked for much too long by a governing body dominated by interests acting without sound grounds in the dis-interest of the community.

Worthy of Promotion by Sewage Plant Operators

As "the detergent of tomorrow," a new suds-free detergent is being widely pushed on the radio and in magazine and newspaper advertising.

"ALL" is the name of this newest of detergents which is advertised as being superior for washing all clothing and general kitchen and household use. Says the radio voice "Why put up with the old-fashioned sudsy detergents which foam all over everything and interfere with the proper functioning of washing machines"? Furthermore, says the voice "ALL" is more economical to use; requires no bleach; no water softener. It carries the endorsement of Westinghouse and other leading washing machine manufacturers.

To those sewage plant operators who have had the frothing problem to contend with "ALL" may be "the answer to the maiden's prayer." Fact is, sewage works men may be doing a favor to all concerned by actually "plugging" for the suds-less "detergent of tomorrow" in their home community, while hoping that competition will result in *all* detergents taking on the favorable characteristics of "ALL."

Lyle Gustaveson

CHICAGO SEWAGE EQUIPMENT

CHICAGO-SELAS HEAT TRANSFER SYSTEMS

A proven principle of high rate heat transfer

Maximum Efficiency, Minimum Maintenance

This widely used principle of direct, controlled heat transfer has found universal acceptance in industrial applications. It was developed by the Selas Corporation of America and first applied to sludge heating at the City of Philadelphia. Chicago Pump Company engineers and Selas combined their specialized knowledge to produce Chicago-Selas Heat Transfer Systems for sludge heating.

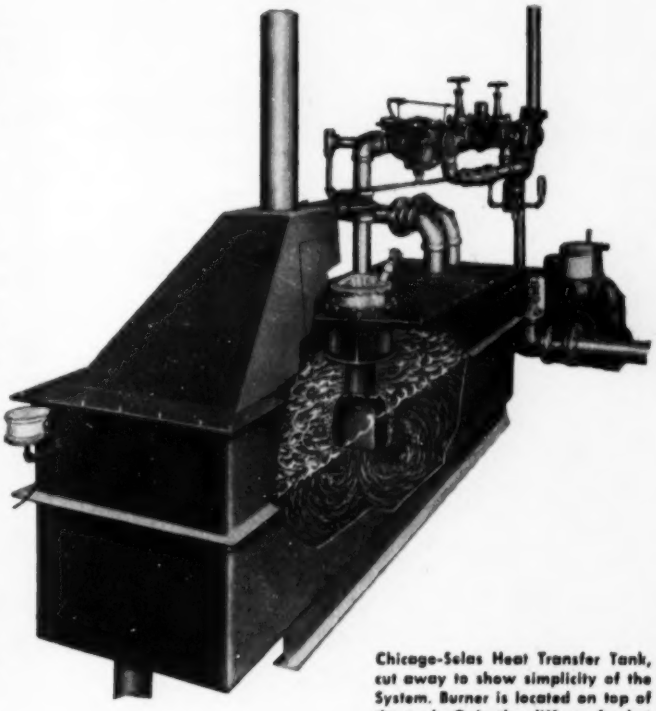
These systems provide positive high rate direct heat transfer from hot gases of combustion to sludge. A 10 to 20 Degree F. temperature rise in the sludge is accomplished in one pass through a small heat transfer tank. Approximately 90% of the heat available in the digester gas is directly transferred to the sludge. The heat available per cubic foot per hour of combustion space is up to 200 times that provided by ordinary combustion methods used in digester heat exchangers. This high rate of temperature rise is accomplished with precise temperature control.

Hot gases of combustion produced in the burner are expelled at the rate of about 30 fps. This causes great agitation and thorough mixing of the sludge in the heat transfer tank. This rapid agitation and mixing throughout the sludge insures efficient and thorough direct heat transfer through the sludge.

Because heating is accomplished in a tank, there are no sludge tubes to cake or clog—no labor for cleaning.

In medium size plants there is frequently only sufficient gas production for use in either gas engines or sludge heating. The high efficiency of the Chicago-Selas System permits the use of gas in both applications. This is accomplished by placing heat exchange tubes in the sludge heating tank.

All gas control and safety equipment is approved by Associate Factory Mutual Fire Insurance Companies.



Chicago-Selas Heat Transfer Tank, cut away to show simplicity of the System. Burner is located on top of the tank. Only the diffuser for hot gas extends into the sludge.

ADDED ADVANTAGES of Chicago-Selas . . . Heat distributed without mechanical equipment in digester • Heat transfer efficiency is constant regardless of length of operation • Heated digesters now practical for both new or existing small plants • Operates efficiently on nationally available stand-by manufactured gas • Minimum variation in sludge temperature from top to bottom of tank • Easily accessible for service • Heater and transfer tank may be located at digester, requiring minimum piping and valves.

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SEWAGE EQUIPMENT DIVISION

622 DIVERSEY PARKWAY

Flush Kleen, Scru-Peller, Plunger. Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.

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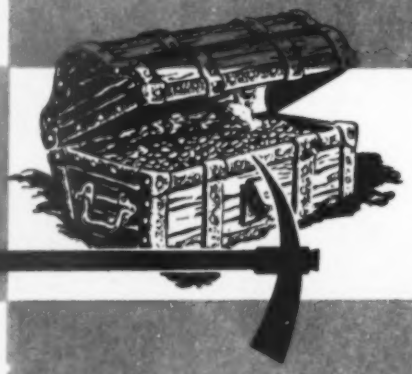
"Buried Treasure"

that is...

if they're WELSBACH-Kitson



Not pirate gold or pieces of eight... but that "buried treasure" is the extra quality built right into Welsbach-Kitson corporation and curb stops. The quality and dependability of Welsbach-Kitson products means that you'll have fewer replacement problems... and no costly excavating. They're built to give lasting service and satisfaction. When you install Welsbach-Kitson products underground, you'll find that they are really "buried treasure"—but the kind of "buried treasure" you won't want to—or have to—dig up!

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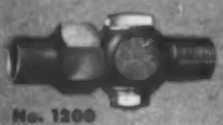

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for underground installations insist on highest quality... insist on WELSBACH-Kitson!

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Meetings Scheduled

Sept. 1-5, Winnipeg, Can. *(Royal Alexandria)*
MINNESOTA SECTION A.W.W.A. Sec'y, L. N. Thompson, Water Department, St. Paul 2, Minn.

Sept. 2-4—Ames, Ia. *(Iowa State College)*
IOWA SEWAGE WORKS ASSOCIATION. Sec'y, Leo Holtkamp, P.O. Box 310, Webster, Ia.

Sept. 2-3—Morgantown, W.Va. *(Hotel Morgan)*
WEST VIRGINIA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, G. O. Fortney, State Dept. of Health, Charleston, W.Va.

Sept. 3-4—Morgantown, W.Va. *(Hotel Morgan)*
WEST VIRGINIA SECTION A.W.W.A. Sec'y, H. K. Gidley, State Dept. of Health, Charleston 5, W.Va.

Sept. 3-4—Escanaba, Mich. *(Hotel Delta)*
MICHIGAN SECTION A.W.W.A. Sec'y, T. L. Vander Velde, State Dept. of Health, Lansing, Mich.

Sept. 9-11—Lake Placid, N.Y. *(Lake Placid Club)*
NEW YORK SECTION A.W.W.A. Sec'y, Kimball Blanchard, 50 West 50 St., New York, N.Y.

Sept. 10-11—Cleveland, O. *(Hotel Cleveland)*
OHIO SECTION A.W.W.A. Sec'y, M. E. Druley, Dayton Power & Light Co., Wilmington, Ohio.

Sept. 21-23—Owensboro, Ky. *(Owensboro Hotel)*
KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSOCIATION. Sec'y, R. Paul Farrell, 420 Sixth Ave., N., Nashville 3, Tenn.

Sept. 21-23—Owensboro, Ky. *(Owensboro Hotel)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. Sec'y, J. W. Finney, 420 6th Ave., N., Nashville, Tenn.

Sept. 21—Santa Fe, N.M. *(Hotel La Fonda)*
ROCKY MOUNTAIN SEWAGE WORKS ASSOCIATION. Sec'y, C. E. Harness, 271 City & County Bldg., Denver, Colo.

Sept. 22-23—Santa Fe, N.M. *(Hotel La Fonda)*
ROCKY MOUNTAIN SECTION A.W.W.A. Sec'y, George J. Turre, Board of Water Commissioners, P.O. Box 600, Denver, Colo.

Sept. 21-23—East Lansing, Mich. *(Michigan State College-Kellogg Center)*
MICHIGAN SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, D. M. Pierce, Room 334, Administration Bldg., Lansing, Mich.

Sept. 21-22—Amherst, Nova Scotia *(Fort Cumberland Hotel)*
MARITIME BRANCH, CANADIAN SECTION A.W.W.A. Sec'y, J. D. Kline, P.O. Box 574, Halifax, N.S.

Sept. 22-24—Milwaukee, Wis. *(Hotel Pfister)*
WISCONSIN SECTION A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison 3, Wis.

Sept. 22-24—Rapid City, S.D. *(Alex Johnson Hotel)*
SOUTH DAKOTA WATER & SEWAGE WORKS CONFERENCE. Sec'y, Charles E. Carl, State Dept. of Health, Pierre, S.D.

Sept. 23-25—Edmonton, Alberta *(Macdonald Hotel)*
WESTERN CANADA WATER & SEWAGE CONFERENCE. (Operators' School Sept. 23) Sec'y, W. J. Waddell, 617-7th Ave., East. Calgary, Alberta.

Sept. 23-25—Omaha, Neb. *(Hotel Paxton)*
NEBRASKA SECTION A.W.W.A. Sec'y, E. Bruce Meier, University of Nebraska, Lincoln, Neb.

Sept. 23-25—Atlanta, Ga. *(Georgia Inst. Technology)*
GEORGIA WATER & SEWAGE SCHOOL (22nd Annual Meeting). Director, N. M. deJarnette, Dept. of Public Health, Atlanta, Ga.

(Continued on page 86A)

Starting point for quality products

Quality products begin with quality ingredients. That's why Nialk Chemicals are used today in so many exacting applications.

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NIALK LIQUID CHLORINE: Nothing is more essential to human well-being than pure, safe drinking water! That's why NIALK Liquid Chlorine — long relied upon for highest quality and uniformity — is in use today in water purification plants throughout America!

Niagara Alkali was the first producer of liquid chlorine in commercial quantities. Thanks to strict quality control — extending right down to the scrupulously clean tank cars in which it is delivered — NIALK Liquid Chlorine has continued to serve America for many years.

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- CAUSTIC POTASH
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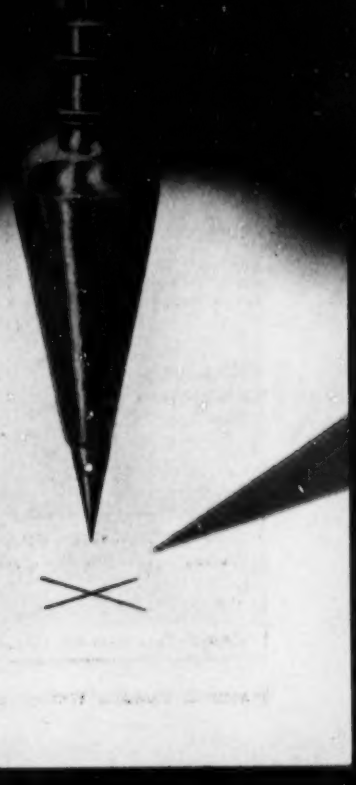
- PARADICHLOROBENZENE
- CAUSTIC SODA
- TRICHLORethylene
- (TETRACHLORO PHTHALIC ANHYDRIDE)



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is why Spiraflo Clarifiers and Spiragesters give high removals of B.O.D. and S.S.

70 to 80% actual detention of the theoretical results in 70 to 80% removals of the S.S. by primary SPIRAFLO clarifiers without the use of pre-aeration or the use of chemicals. Can you beat it?

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Cable Drum Clutch
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OK CHAMPION Power Sewer Cleaner

Twin rigs take debris from sewer to street in one operation.

Mounted on four wheel trucks—safer—eliminates lifting over or pulling away from manholes—safer tandem towing.

All Controls at Working End—keeps operator out of passing traffic—allows full vision of work.

Built-in Gear Reduction Ratio—allows better use of power for bucket travel.

Fully Automatic Safety Clutch—instant acting—avoids damage to tiles and machines.

Rely on the pioneer manufacturer of power sewer cleaners.

CHAMPION CORPORATION
Hammond, Indiana

SEND FOR LITERATURE

Champion Corporation, 4700 Sheffield Ave., Hammond, Indiana
Please send information on new OK Champion Power Sewer Cleaners.

Name.....Title.....

Address.....

(*Continued from page* 84A)

Sept. 26—Livingston, N.J. *(Doerr's Grove)*
NEW JERSEY SEWAGE & INDUSTRIAL WASTES ASSOCIATION. (14th Annual Outing). Sec'y, Michael S. Kachorsky, P.O. Box 766, Manville, N.J.

Sept. 27-29—Excelsior Springs, Mo. *(Elms Hotel)*
MISSOURI SECTION A.W.W.A. Sec'y, Warren A. Kramer, State Office Building, Jefferson City, Mo.

Sept. 27-29—Excelsior Springs, Mo. *(Elms Hotel)*
MISSOURI WATER & SEWAGE CONFERENCE. Sec'y, Warren A. Kramer, State Office Bldg., Jefferson City, Mo.

Sept. 28-30—Poland Spring, Me. *(Poland Spr. House)*
NEW ENGLAND WATER WORKS ASSOCIATION (72nd Annual Convention). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Oct. 1-2—Minot, S.D. *(Leland Park Hotel)*
NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE. Sec'y, Jerome H. Svore, State Dept. of Health, Bismarck, N.D.

Oct. 4-6—Jackson, Miss. *(Hotel Heidelberg)*
ALABAMA-MISSISSIPPI SECTION A.W.W.A. Sec'y, Chas. W. White, State Dept. Health, 537 Dexter Ave., Montgomery, Ala.

Oct. 8-10—Ponte Vedra, Fla. *(Ponte Vedra Inn)*
AMERICAN CONCRETE PRESSURE PIPE ASSOCIATION. (5th Annual Convention). Director, Howard F. Peckworth, 228 North LaSalle St., Chicago, Ill.

Oct. 11-13—Miami, Fla. *(Hotel McAllister)*
FLORIDA SECTION A.W.W.A. Sec'y, William W. Aultman, Dept. of Water & Power, Box 316, Coconut Grove Sta., Miami 33, Fla.

Oct. 13-16—Miami, Fla. *(Municipal Auditorium)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN. (26th Annual Meeting). Exec. Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
(joint meeting with)
FLORIDA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, D. P. Schiesswohl, P.O. Box 210, Jacksonville, Fla.

Oct. 14—Rumsford, Me.
MAINE WATER UTILITIES ASSOCIATION (Annual Meeting). Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Oct. 14-16—Waterloo, Iowa *(Hotel Russell Lamson)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pederson, Municipal Bldg., Marshalltown, Iowa.

Oct. 18-21—Houston, Tex. *(Rice Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Auditorium, Little Rock, Ark.

Oct. 19-21—Pittsburgh, Pa. *(Hotel William Penn)*
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA. Sec'y, W. M. Porter, Hotel William Penn, Pittsburgh, Pa.

Oct. 19-23—New York, N.Y. *(Eng. Societies Bldg.)*
AMERICAN SOCIETY OF CIVIL ENGINEERS (Annual Meeting). Sec'y, Wm. N. Carey, 33 W. 29 Street, New York 18, N.Y.

Oct. 20-22—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

(*Continued on page* 90A)

the Place

CHOUTEAU OKLAHOMA

the Pipe

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ALL over America, economy and efficiency-minded officials are choosing "Century" Asbestos-Cement Pipe for water mains. Here are some excellent reasons:

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Put all these advantages together and you see why so many towns now get their water through "Century" asbestos-cement pressure pipe.

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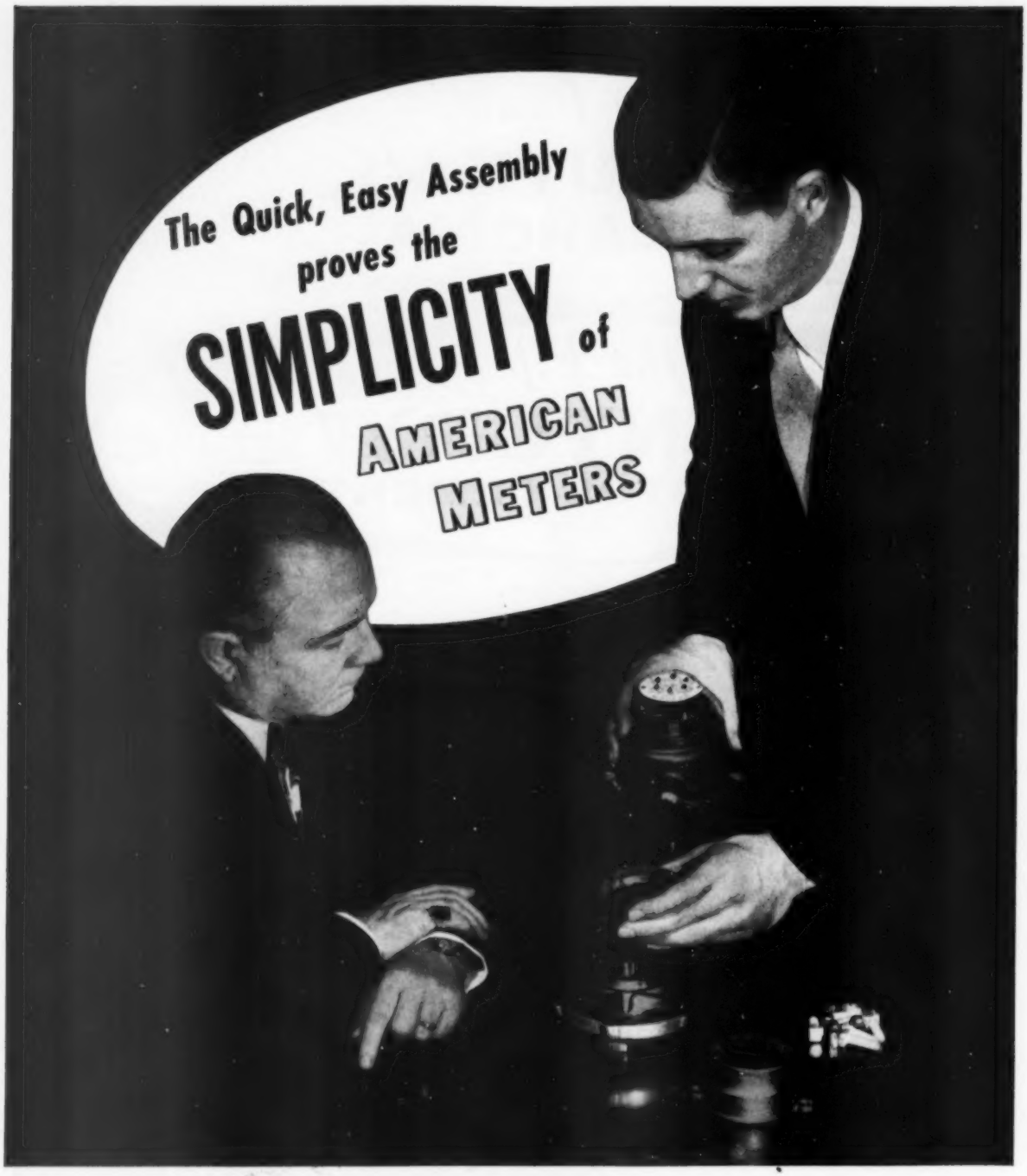
"Century" pipe installation from Grand River Dam to the City of Chouteau, Oklahoma. Engineers: Hoil Engineering Corp., Contractors: Eagle Construction Co., both of Tulsa.

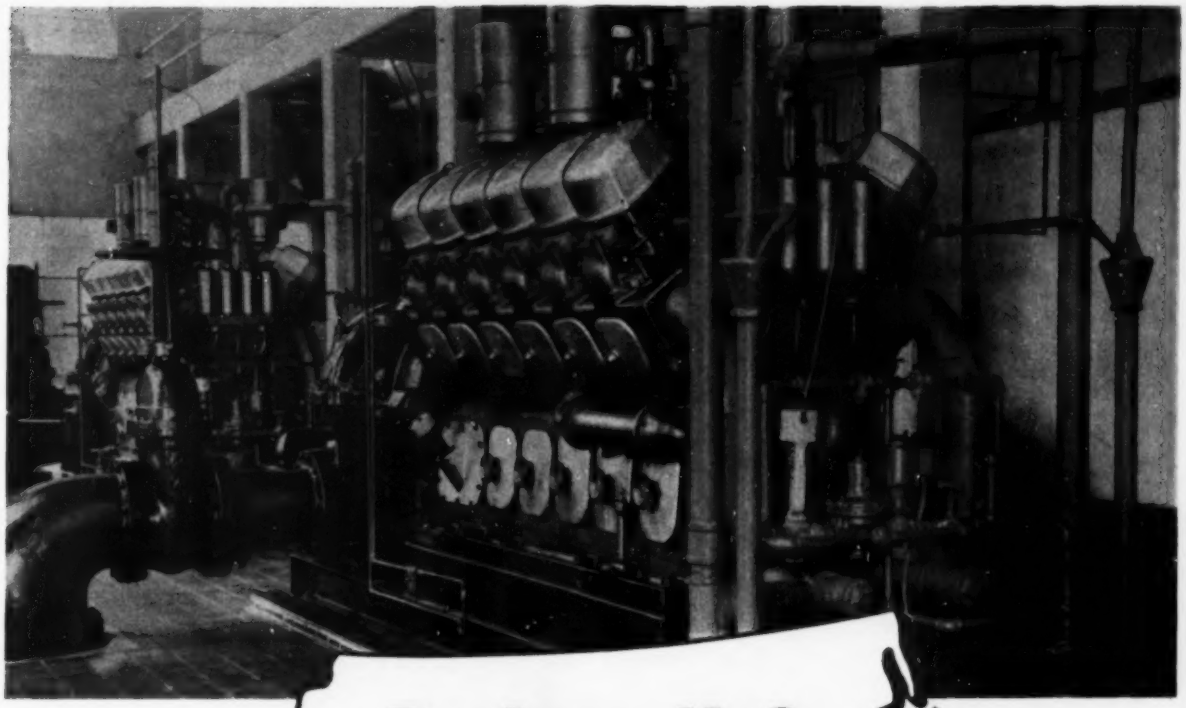


• Quick dismantling — quick re-assembly —is possible whenever repairs are needed. American Meter parts are interchangeable but you can't assemble them the wrong way. You work right side up and can see as you place the parts in position. Earning time is increased, shop time is reduced to a minimum.

Ask for complete data.

BUFFALO METER CO.

2909 MAIN STREET, BUFFALO 14, NEW YORK



Durham, N. C. counts on LE ROI L3460's

to provide dependable emergency power for water-pumping service

Here's what officials of Durham did, when they had to scrap their obsolete steam-engine-driven pumps: They replaced them with two modern pumping units that were powered by Le Roi L3460 engines.

There are five sound reasons why their selection of *Le Roi* was a wise one:

1. Le Roi engines are built by a manufacturer with many years of experience in meeting the specialized power requirements of heavy-duty service.
2. Le Roi engines are the most powerful engines in the medium-speed, heavy-duty class — yet are compact and call for relatively low investment.
3. Le Roi engines have the weight and stamina to withstand the punishment of continuous operation without costly breakdowns.
4. Le Roi engines are precision-machined for smooth operation, longer life.
5. Le Roi engines have plenty of power in reserve to handle the heavy loads.

These are reasons why many municipalities insist on Le Roi power for pumping, for generating electricity, for standby service.

Enjoy dependability you can count on — economy that helps lighten the tax load in your community. Use reliable low-cost Le Roi power. Le Roi engines are available in sizes from 20 to 600 hp —custom generator sets in sizes from 50 to 300 KW. They operate on no-cost sewage gas, natural gas, butane or gasoline.

Write today for detailed information

LE ROI

E-96

LE ROI COMPANY

Dept. WA-9 • 1706 S. 68th Street • Milwaukee 14, Wis.

Plants: MILWAUKEE CLEVELAND GREENWICH, OHIO

(*Continued from page 86A*)

Oct. 22-24—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Oct. 26-28—Niagara Falls, Ont. *(General Brock Hotel)*
CANADIAN INSTITUTE ON SEWAGE & SANITATION. Sec'y, Dr. A. E. Berry, Parliament Bldgs., Toronto, Ont.

Oct. 26-29—New Orleans, La. *(Roosevelt Hotel)*
AMERICAN PUBLIC WORKS ASSOCIATION. Exec. Sec'y, Donald F. Herrick, 1313 East 60th St., Chicago, Ill.

Oct. 27-28—Springfield, Ill.
ILLINOIS WATER PLANT OPERATORS. (22nd Annual Fall Convention). Sec'y, Charles L. Baylor, Downers Grove, Ill.

Oct. 27-30—Philadelphia, Pa. *(Benjamin Franklin Hotel)*
NATIONAL WATER WELL ASSOCIATION. Sec'y, Robert R. Storm, 811 W. Springfield, Champaign, Ill.

Oct. 27-30—San Francisco, Calif. *(Palace Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, J. C. Luthin, 1113 Laurent St., Santa Cruz, Calif.

Oct. 28-30—Wilmington, Del. *(Hotel DuPont)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, C. J. Lauter, 6955 33rd Street, Washington 15, D.C.

Nov. 4-6—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION A.W.W.A. Sec'y, J. P. Kavanagh, 915 Colonial-American Bank Bldg., Roanoke, Va.

Nov. 5—East Providence, R.I. *(Wannamoisett Country Club)*
NEW ENGLAND SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Stephen M. Hurley, Jr., 331 State Office Bldg., Providence, R.I.

Nov. 5-7—Yakima, Wash. *(Hotel Chinook)*
PACIFIC NORTHWEST SEWAGE & INDUSTRIAL WASTE ASSOCIATION. Sec'y, Robert O. Sylvester, Univ. of Washington, Seattle, Wash.

Nov. 9-11—High Point, N.C. *(Sheraton Hotel)*
NORTH CAROLINA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Nov. 9-11—High Point, N.C. *(Sheraton Hotel)*
NORTH CAROLINA SECTION A.W.W.A. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Nov. 9-13—New York, N.Y. *(Statler & New Yorker)*
AMERICAN PUBLIC HEALTH ASSOCIATION. Sec'y, Mrs. W. R. Walsh, A.P.H.A., 1790 Broadway, New York, N.Y.

Nov. 12-13—Lincoln, Neb. *(Hotel Capitol)*
NEBRASKA SEWAGE & INDUSTRIAL WASTE ASSOCIATION. Sec'y, Paul W. Mousel, 602 W. B. Street, McCook, Neb.

Nov. 16-20—Stillwater, Okla. *(Okla. A. & M. College)*
OKLAHOMA WATER, SEWAGE & IND. WASTES SHORT COURSE. Sec'y, H. J. Darcey, State Dept. of Health, Oklahoma City, Okla.

Dec. 9—Waterville, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Dec. 13-16—St. Louis, Mo.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. (Annual Meeting). Sec'y, E. G. Van Antwerpen, 120 East 41st St., New York 17, N.Y.

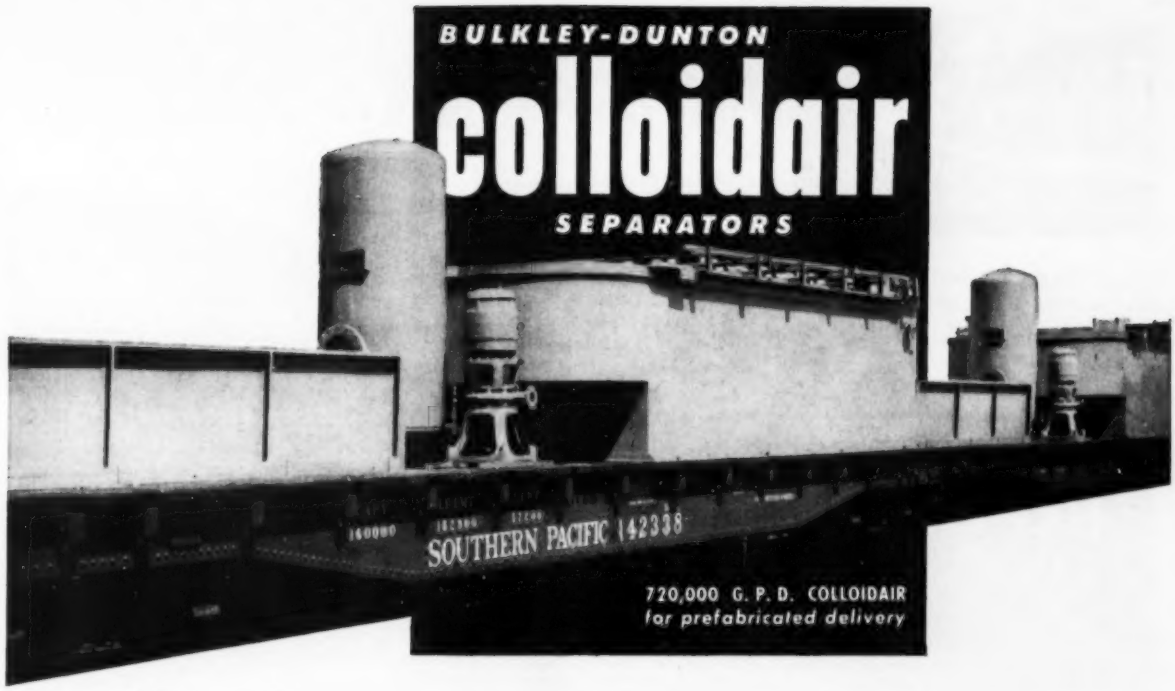
Jan. 19, 1954—New York, N.Y. *(Hotel Commodore)*
NEW YORK SECTION A.W.W.A. (Winter Luncheon Meeting) Sec'y, Kimball Blanchard, 50 West 50th Street, New York, N.Y.

Jan. 21-22—New York, N.Y. *(Hotel New Yorker)*
NEW YORK SEWAGE & INDUSTRIAL WASTES ASSOCIATION. 21 No. Broadway, White Plains, N.Y.

Apr. 22-23—Watertown, N.Y. *(Woodruff Hotel)*
NEW YORK SECTION A.W.W.A. Annual Spring Meeting. (Registration evening of 21st). Sec'y, Kimball Blanchard, 50 West 50th Street, New York, N.Y.

the
MODERN
approach
Cast iron pipe centrifugally cast and with mechanical joints is the most efficient and economical means of modern day distribution. Serving the industry with Super de Lavaud cast iron pipe centrifugally cast in modern long lengths with standardized Mechanical Joints, Bell and Spigot or Flanged, with or without centrifugally applied cement lining. Rugged, dependable and economical.
General Sales Offices
ANNISTON, ALABAMA
We invite inquiries to our nearest sales office
ALABAMA PIPE COMPANY
ANNISTON ALABAMA

In the HEART of
DETROIT
Facing Grand Circus Park
First thing to do in Detroit is check in at Hotel Tuller! You'll enjoy every minute. Newly modernized. Beautifully decorated. Within walking distance of all downtown stores, theatres and business activities . . . yet, you enjoy the evergreen atmosphere of Grand Circus Park . . . The Tuller Coffee Shop or Cafeteria for excellent food modestly priced.
VISIT OUR
COCKTAIL LOUNGE
ONE OF DETROIT'S FINEST
800 ROOMS from $3
Harry E. Poulsen, Gen. Mgr.
HOTEL TULLER



Packaged

1. SMALL MUNICIPALITY SEWAGE TREATMENT

2. INDUSTRIAL WASTE TREATMENT

HIGH EFFICIENCIES • LOW SPACE REQUIREMENTS • PROVEN PERFORMANCE

→ PRIMARY FLOTATION CLARIFIERS

Prefabricated flotation cells utilizing the dissolved gas method for high efficiency on a wide variety of suspended solids, oils, and greases. Available in sizes from 25 G.P.M. to 2000 G.P.M. in steel, and to 6000 G.P.M. in tile or concrete.

→ PACKAGED TRICKLING FILTERS

The Colloidair Trickling Filter is of package design for economical installation where smaller sizes are indicated. Standard and high rate models.

→ ROTARY VACUUM and PLATE and FRAME FILTERS

Complete line of rotary vacuum filters utilizing precoat sweetener or flocculents. Complete line of plate and frame or tubular element filters, manual or automatic backwash.

Bulkley-Dunton engineered sewage and waste water treatment equipment meets city and state disposal requirements. Write for details!

BULKLEY-DUNTON PROCESSES, INC.

Dept. N-1, 295 Madison Avenue, New York 17, N. Y.

Pacific Coast: Dept. N-1, Security Building, Pasadena, Calif.

Meet These Exhibitors at the Miami Convention

The following member firms of the Water and Sewage Works Mfgrs. Assn. are to stage exhibits at the convention of the Federation of Sewage and Industrial Wastes Associations, to be held at the municipal Auditorium, Miami, Fla., Oct. 13-16.

American Car & Foundry Co.
American City Magazine
American Well Works
Armco Drainage & Metal Prod.
Builders-Providence
Carter Co. (Ralph B.)
Chain Belt Co.
Chicago Pump Co.
Combustion Engineering
Dorr Co., Engineers
Engineering News-Record
Fischer & Porter Co.
Foxboro Co.
General Electric Co.
General Laboratory Supply Co.
Hardinge Co.
Industrial Materials Co.
Inertol Co.
Infilco Inc.
Jeffrey Mfg. Co.
Johns-Manville
Lakeside Engineering Corp.
Link-Belt Co.
Lock Joint Pipe Co.
Nichols Eng. & Research Corp.
Omega Machine Co.
Pacific Flush Tank Co.
Preload Co.
Price Brothers Co.
Public Works Magazine
Simplex Valve & Meter Co.
Vapor Recovery Systems Co.
Walker Process Equipment
Wallace & Tiernan Co.
Wastes Engineering
Water & Sewage Works Mag.
Yeomans Brothers Co.

Note: The Florida Section of A.W.W.A. will hold its meeting also in Miami, October 11-13 just preceding the Sewage Federation Convention.

Clarification at

SOUTH STOCKTON SEWAGE TREATMENT PLANT

City of Stockton, California

***REPEAT ORDERS** of Process Type C Clarifiers Mean Satisfied Users*

A FEW REASONS:

This efficient sewage treatment plant designed by
Engineering Office of Clyde C. Kennedy, Consulting Engineers
Marshall Dunlap, City Engineer
F. Wayland Jones, Plant Superintendent

1. The drive-head includes a spur gear driven by a pinion attached to the output shaft of a standard vertical motor-reducer.
2. The load is taken by a large diameter Timken or equal precision machined bearing having a capacity four to six times the load applied.
3. Service.
4. Long Life.
5. Attractive appearance.

Process Type C Clarifiers and other equipment for water, sewage and waste treatment are described and illustrated in Bulletin #117, "Clarification". Write to any of the addresses below.

PROCESS ENGINEERS INCORPORATED

Chemical, metallurgical, industrial, sanitary equipment and processes

6381 Hollywood Blvd.
Los Angeles 28, Calif.

1017 Vermont Avenue
Pittsburgh 34, Pa.

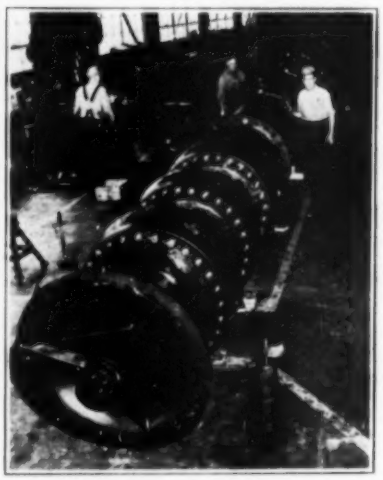
212 Sutter Street
San Francisco 8, Calif.

Representatives

Rocky Mountain States
Dana E. Kepner
1921 Blake Street
Denver 2, Colorado

Southeast
Harold J. Spaeder
163 Forrest Blvd.
Decatur, Georgia

Southwest
J. W. Droke & Assoc.
P. O. Box 823
Fort Worth 1, Texas



Giant and Midget in the Pump Field

In the accompanying picture you see the largest turbine well pump ever built. Beside it, dwarfed in size, is one of the smallest turbine well pumps—a 6 inch unit.

This picture was made in the Pomona (Calif.) Plant of Fairbanks-Morse Co. The "giant" is one of four such units built for the American Air Force rocket research base at Tullahoma, Tenn. Each of these 48-inch monsters is 42 ft. long, weighs 15 tons, and will deliver 25,000 gals. per minute. The Beloit-built F-M motors are 2,000 hp. units.

These giant pumps are believed to be the world's largest turbine pumps.

clean water wells with Calgon*

why?

Because users get good results!

for example?

One plant had a well capacity increase of from 140 gpm to 520 gpm after cleaning with Calgon.

anything else?

Yes . . . Calgon is harmless in any concentration, clean, dry and easy to handle, forms no toxic fumes.

And if you'll write or call us, we'll be glad to tell you about using Calgon to increase the productivity of your water wells.

calgon, inc.

A Subsidiary of Hagan Corporation
Hagan Building, Pittsburgh 30, Pa.

HAGAN
HALL
BUROMIN
CALGON

*T.M. Reg. U.S. Pat. Off.

Denver Adopts Fluoridation for Part of Water Supply

Nature Provides the Optimum Content in Major Portion

The Denver, Colo., city council recently approved unanimously the addition of fluoride to a portion of the city's water supply.

The fluoridation treatment recommended by the board of health and the department of health and hospitals, will begin in a few weeks as soon as equipment can be installed at the Moffat filter plant.

Health authorities advised adding fluorine to that portion of Denver's water supply (about 25 per cent) which comes from the western slope. Water from the South Platte river contains the proper amount of fluorine, council was told.

Pickups from Purdue's "Sanitary Engineering News"

Don E. Bloodgood, Editor

In studies made on the chlorination of sewage it has been found that the presence of ammonia enhances the bactericidal effect of chlorine.

Cyanide solutions of from 40 to 100 ppm when applied to fully acclimatized trickling filters converts 50 to 100% of the nitrogen of potassium, cadmium, zinc and copper cyanides into ammonia, nitrite and nitrate.

* * *

Information Bulletin No. 68, *"Michigan Municipal Wages and Salaries,"* published by the Michigan Municipal League, presents data on hours of work, overtime pay practices, and holiday pay practices of municipal employees in 105 Michigan cities and villages.

* * *

The end liquor from the manufacture of mono-sodium glutimate has a B. O. D. of 250,000 ppm.

* * *

Someone told me that the average number of roaches in a sewer manhole is 72.

* * *

Bact. coli die more rapidly under anaerobic than aerobic conditions.

* * *

The University of California is studying the travel of pollution in water being returned to the earth by injection wells.

* * *

The cost of sewage treatment in New York City for 1952 was $18.80 per million gallons.

* * *

The chlorine demand of a 2% lactose solution is 1 ppm or less.

* * *

Do you know that you can usually get your public library to borrow any reference you need through inter-library loan service?

* * *

The San Francisco North Point sewage plant uses steam, produced in a steam generation unit, for cleaning of concrete. How would a wallpaper removing unit work for such a job?

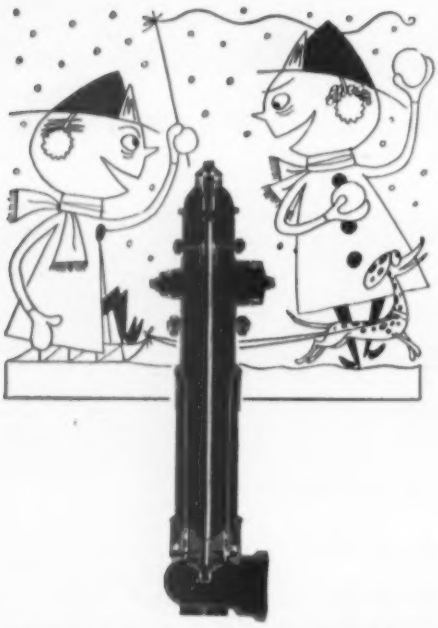
* * *

Isotopes for locating leaks in a water main have been used in England. The procedure is described in April 3 issue of Municipal Engineering (England). Radioactive sodium carbonate was the material used.

* * *

Work at Birmingham (England) during the year has confirmed that the four large percolating filters there, when treating sewage by alternate double filtration, operate more efficiently when each distributor revolves once in 30 minutes than when it revolves in one to five minutes.

Fair Weather or Foul . . . No Water Can Enter Head to Freeze, No Sediment Can Reach Operating Thread



MATHEWS HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

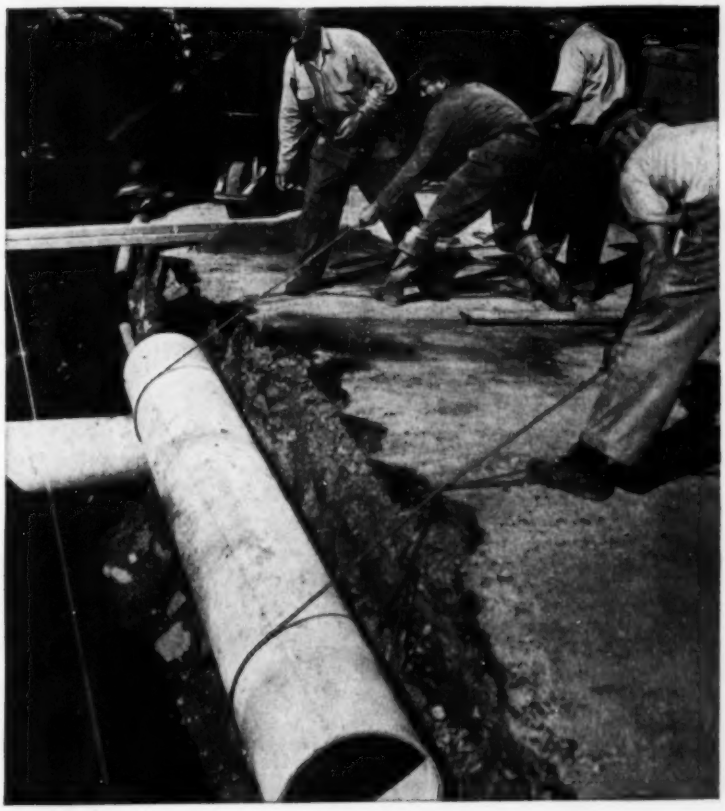
- The stuffing box plate, cast integral with the nozzle section, covers the entire area of the head and, with the packing, prevents water from reaching the operating thread. This means no rust can form and no sediment can be deposited on the thread to wear and destroy it.
- No matter how cold the weather, the stem thread cannot freeze to the nut, nor can ice form inside it to interfere with closing the hydrant.
- Community fire protection is assured with the installation of Mathews Hydrants—vital links between hose and water main.

No Other Hydrant Offers So Many Essential Features

Compression type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in removable barrel • A modern barrel makes an old Mathews good as new • Available with mechanical-joint pipe connections

150th anniversary

You can cut installation costs ... lay pipe faster... speed completion of entire job...



—Because of this RING-TITE JOINT used with Transite Sewer Pipe

Long 13-foot lengths of Transite* Pipe are rapidly assembled with the Ring-Tite Coupling. With it, dollars-and-cents savings will be realized every step of the way during construction of the line.

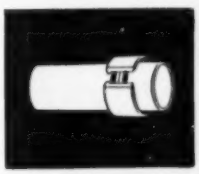
The 13-foot lengths reduce the number of joints and permit the pipe to be brought quickly and accurately to grade. Still more time is saved since each Ring-Tite joint can be checked as fast as it is assembled to reduce delays in backfilling and speed completion of the job.

LIGHT IN WEIGHT

Other time and money-saving advantages of Transite Sewer Pipe are found in its light weight and easy handling. These reduce trucking costs and pay off in simplified operation all along the line. And, too, the Ring-Tite joint eliminates the necessity for hot compounds and the time-consuming procedures that go with their use.

May we send you more facts about this asbestos-cement pipe and its Ring-Tite joint... and how they reduce infiltration to a minimum and cut other sewage costs as well? No obligation, of course. Please write for folder TR-103A. Address Johns-Manville, Box 60, New York 16, New York.

Why the RING-TITE JOINT cuts your sewage costs



Two rubber rings and Transite Sleeve (see cut-away view) can be assembled quickly over Transite Pipe ends to make a pressure-tight joint. These flexible joints effectively absorb vibration, help compensate for soil movements.

AND BUILDING SEWER PIPE, TOO! **Another J-M Asbestos-Cement Pipe, Transite Building Sewer Pipe, assures a tight sewer system throughout.** Many municipal officials are insisting that house and building connections to their sewage lines be made with Johns-Manville Building Sewer Pipe to assure tightness throughout their systems. This pipe also has the same type of rubber ring sealed joint that is shown above.

*Reg. U. S. Pat. Off.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE SEWER PIPE

Prospecting a New Use for a Water Tunnel

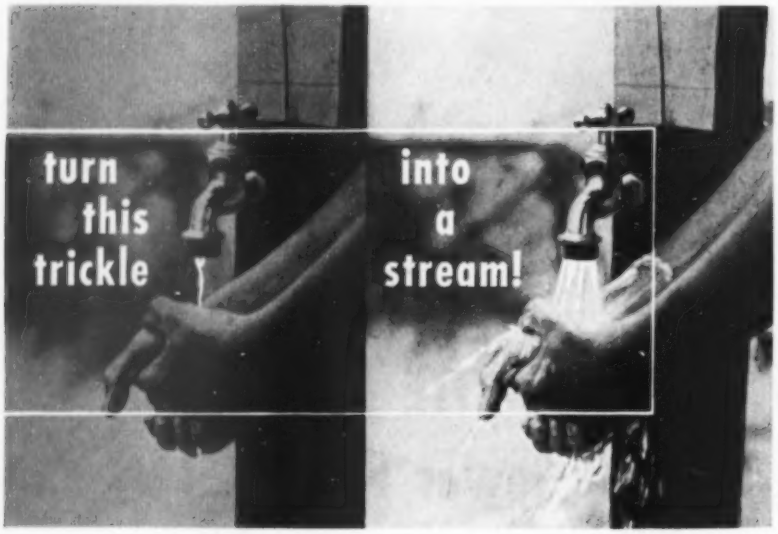
The Metropolitan Water District has given permission for prospecting of southern California, La Verne, Calif., for minerals in its huge water tunnel at Temescal Canyon.

The announcement came from the County Board of Trade. Board Chairman T. C. Likins said he has asked the State Division of Mines to undertake the prospecting.

"The Temescal tin area has long been regarded as a potential domestic source of tin," Likins said.

"Since past explorations have been limited to core samplings, a few shafts and surface out-croppings, many recognize exploration of the tunnel as an excellent opportunity for adding to the existing knowledge of this area."

The tunnel, which is large enough to drive a truck through, will carry water from Lake Mathews toward the Santa Ana area. It is not yet lined with cement.



If loss of pressure is your water problem, the source of trouble may be tuberculation and corrosion in your pipelines. In this case the Centriline process can turn this trickle into a stream . . . and can put smiles back on the faces of the taxpayers of your community.

Centrilining is the application of cement mortar to the walls of pipelines in place, after cleaning. At a fraction of the cost and trouble of replacement, Centrilining extends the life of old pipes *indefinitely*. For complete information on this time proven process, write for your free copy of Centriline's new booklet.

Pipelines 4" to 14" are cement-lined by the Tate Process.

CEMENT-MORTAR LININGS FOR PIPES IN PLACE

3,000,000 FEET **OF EXPERIENCE**

CENTRILINE CORPORATION

A subsidiary of Raymond Concrete Pile Co.

140 CEDAR STREET, NEW YORK 6, N. Y.

Branch Offices in Principal Cities of United States and Latin America

Safety Grating

901

The Globe Company, Chicago, Ill., has developed the Safety Grip-Strut Grating. The name is derived from the nature of the product which presents an anti-skid surface on the edges of a series of formed struts.

The grating appears as a diamond shaped pattern in which the percentage of open area is in excess of 75% of the total recticulated surface. The struts or vertical members are joined by integral saddles to create lateral struts of great strength.

The material used for the manufacture is sheet steel or aluminum of gauges ranging from 12 to 16, and its unique structure makes possible cleaning with a brush or broom.

Badger Meter Opens Los Angeles Office

Badger Meter Mfg. Company, Milwaukee, Wisconsin, has announced the opening of the company's Pacific Coast Division at 2940 Leonis Blvd., Los Angeles 58, Calif., and the appointment of Ross Burns as Western Sales Manager. Burns is a veteran and well-known sales engineer with wide acquaintance in the western waterworks field.

The organization of Badger Meter's Pacific Coast Division is part of an extensive expansion program that includes establishment of the West Coast headquarters and a new plant designed especially for service facilities.

(Continued on page 98A)

You Can Cut Sewerage and Drainage Costs 3 Ways....

Specify TYLOX Flexible Rubber PIPE JOINTS

ON INSTALLATION . . .

Construction men make *thriftier* bids on TYLOX-Jointed pipe projects, because they can count on the pipe going down *faster*. There's no "fussy" mortaring, calking or collaring to run up costly man hours. Three simple steps (shown in the sketches below) are all it takes to make TYLOX pipe joints. And Tylox eliminates costly delays normally taken for granted on a pipe job . . . For instance, Tylox may be properly installed in wet trenches, and all finished line may be backfilled immediately.

ON MAINTENANCE . . .

Tylox Joints relieve sewerage and drainage budgets of excessive maintenance burden . . . non-deteriorating and non-crumbling Tylox doesn't have to be "dug up" for repairs. Tylox Joints are made of a specially compounded rubber which resists sewage and industrial waste acids, and is virtually ageless. Once installed, they outlast the pipe itself.

ON SEWAGE TREATMENT

Tylox Joints completely defeat infiltration at pipe joints, saving substantially on the cost of operating sewage treatment plants. Tylox seals by compression, not adhesion. When the pipe is shoved home, *flexible* Tylox packs the joint's annular space tight by mechanical action, and the natural resilience of the rubber *keeps* it tight, preventing infiltration or root penetration for "the life of the line."

Take advantage of these Tylox features to cut costs 3 ways when planning your sewerage and drainage installations. Specify TYLOX RUBBER JOINTS.

Making Joints with TYLOX RUBBER GASKETS is as simple as A B C

Cement tongue and snap on TYLOX gasket.

Lubricate sliding surfaces with TYLOX cement.

Shove the pipe home to line and grade.

Write today for complete specification data and literature on TYLOX Pipe Jointing Gaskets. 1824

HAMILTON KENT MANUFACTURING COMPANY

225 Gougler Ave. KENT, OHIO Tel. 3449

This newly completed Badger Meter western headquarters plant now stocks the complete line of Badger Meters ranging from ⅝" through 12" sizes, and in addition provides a comprehensive repair service for the entire western area. Supplemental stocks also are carried in Seattle, Wash., and Phoenix, Arizona, to assure immediate service to all western meter users.

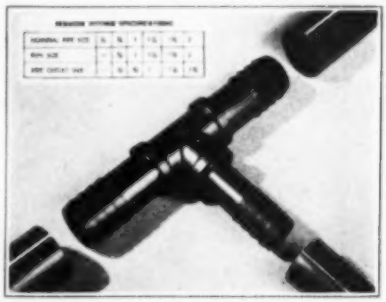
U.S. Pipe Moves General Offices and Consolidates Philadelphia Office

United States Pipe and Foundry Co., Burlington, New Jersey, has announced that the General Office of the Company has been removed from East Pearl Street, Burlington, N.J., to 3300 First Avenue, North, Birmingham 2, Alabama. The telephone number is Birmingham 3-3161.

It was also announced that the Sloss-Sheffield Steel & Iron Division of the Company will be consolidated with the General Office Departments in Birmingham and will no longer operate as a separate division.

The Philadelphia Sales Office has been removed to the former General Office building at Burlington, N.J., and consolidated with the Eastern Sales office.

Branch offices remaining in Burlington are: Eastern Sales Office; Special Products Division; Research & Development Dept.; Export Sales Office; Eastern Traffic Office; and Eastern Purchasing Office.



New Fitting For Flexible Plastic Pipe

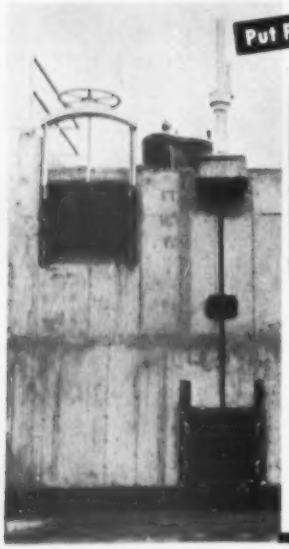
902

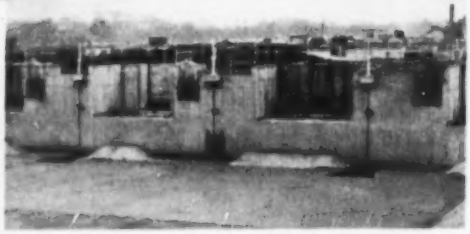
Carlon Products Corporation, Cleveland, Ohio, has announced the availability of a new reducer insert tee fitting in which the side outlet is one standard pipe size smaller than the run. This new fitting is available in run size up to two inches.

This new fitting is quickly and easily joined in the same manner as used for standard insert couplings. Sections of pipe are cut to desired length and fitting inserted. Stainless steel clamps are tightened over the pipe and fitting to draw the pipe down over the serrations of insert to assure positive leakproof joint. No special tools are required and complete connection can be made within two minutes time.

All sluice gates installed in the **United States Steel Corporation's** huge, new Fairless Works, Fairless Hills, Pa., were designed and manufactured by PEKRUL. Shown here are several gates among approximately 200 PEKRUL gates installed in pump stations and sedimentation basins.

Put PEKRUL to Work for You!





Write for Catalog 49...

PEKRUL GATE DIVISION

MORSE

BROS. MACHINERY

DENVER, COLORADO

A. J. Herrmann

J. W. MacKay

ACIPCO Promotes Herrmann and MacKay

American Cast Iron Pipe Co., Birmingham, Ala., has announced the election of A. J. Herrmann as vice president in charge of sales and secretary of the Company. He succeeded Lester Long, who recently retired. By virtue of this new position, Mr. Herrmann will serve on the Board of Directors of the Company and on the Board of Management.

Mr. Herrmann has served as assist-

(*Continued on page* 100A)

READER SERVICE CARDS for

WATER & SEWAGE WORKS

Equipment — Products
Information — Literature

JUST
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THESE
CARDS
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AND
MAIL—
TO
RECEIVE
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LATEST
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OR
LITERATURE
DESCRIBED
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THIS
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WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

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WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

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WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

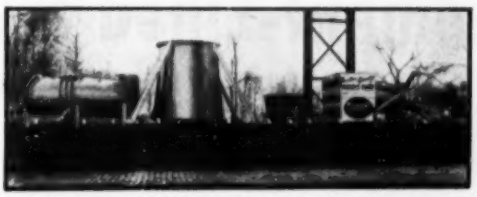
SEWAGE

. . . And Storm Water, too. Both are being handled in trouble-free manner in scores of communities by the "Big Fellows" . . .

Morris
Storm Water and Sewage PUMPS

THE "BIG FELLOW"—a Morris 42" Vertical, Mixed Flow Pump. It's one of several which recently were installed for handling storm water and sewage for a large West Coast community. Has gigantic capacity—60 MGD. Handles raw sewage at 50,000 GPM against 25 Ft. TDH.

What kind of work do these "Big Fellows" do? In some communities, they handle enormous quantities of sewage and storm water. In others, they handle irrigation or drainage. In all instances, they are designed to perform with the utmost efficiency, safety, and dependability. They often take staggering punishment—particularly when conditions are unusual. But these "Big Fellows"—Morris Storm Water and Sewage Pumps—*have extra stamina.*



TAKES ALL OF A FLAT CAR to carry one of these Morris titans of service to its destination.

Of mixed-flow type, many operate with peak efficiency of 90%. Design can be entirely self-contained. Often one forced oiling system lubricates both pump and motor bearings. Motor weight can be supported by strong conical weldment—permitting the transmission of motor loads directly through weldment to heavy cast feet without casing strain. The need for a separate floor to support the motor is eliminated. Large manholes provide maximum accessibility—*impeller ring clearances easily checked.*

Morris Storm Water and Raw Sewage Pumps come in sizes ranging from 12" to 84" diameter discharge — ideally suited for capacities to 450 C.F.S. Other types of sewage pumps from 4" to 24". Horizontal and vertical types. For special use, Morris builds to suit your specifications. Consult a Morris Engineer without obligation.

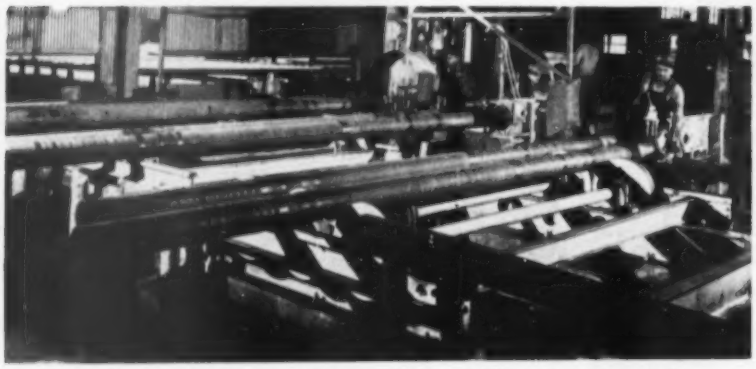
MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Sales Offices in Principal Cities

MORRIS *Centrifugal Pumps*

ant general sales manager of the Company since May, 1952; prior to which time he served as manager of the Acipco Sales Office in Kansas City, Missouri, for 23 years. He started with the Company in Birmingham in 1914, and has worked in various departments including the Carpenter Shop, Machine Shop, Traffic Department, Shipping Department, Loading Yard, Laboratories and Experimental Department. In 1927, he was made assistant manager of the Kansas City office, being promoted to manager in 1929.

At the same time the Company announced the appointment of J. W. MacKay as assistant general sales manager to succeed Mr. Herrmann.

Mr. MacKay has been employed in the Southern Sales Department since the early part of 1951, having served as assistant Southern Sales Manager since June 4, 1952. He became connected with the company in 1936 and his experience includes work in Research and Testing, Engineering Department, Melting Department, Publicity Department, Kansas City Sales office, Plant Engineering, Special Products Department and Sales Engineering.



Centrifugal cement-lining machine in operation at a McWane-Pacific pipe plant.

McWANE-PACIFIC
Cement-Lined CAST IRON PIPE
MAINTAINS FLOW

McWane-Pacific Super-DeLavaud Cast Iron Pipe and Pipe Fittings are furnished with either standard thickness of cement lining or thin cement lining with seal coat, when so specified. The cement lining is applied centrifugally in standard Super-DeLavaud cast iron pipe, either open bell-and-spigot, or Precalked Mechanical Joint.

For those sections of the country where soft water may cause interior tuberculation, cement lining protects the pipe from tuberculation and maintains a high coefficient of flow over a long period of time.

McWane-Pacific cement linings adhere strongly to the interior wall of the pipe. The pipe may be cut and tapped without damage to the cement lining. For complete information, write or telephone—

McWANE Cast Iron Pipe Company
Birmingham, Ala.
Pipe Sizes 2" thru 12"

Sales Offices

Birmingham 2, Ala.	P. O. Box 2601
Chicago 1, Ill.	333 North Michigan Ave.
New York 4, N.Y.	80 Broad Street
Kansas City 6, Mo.	1006 Grand Avenue
Dallas, Texas	1501 Mercantile Bk. Bldg.

PACIFIC STATES Cast Iron Pipe Co.
Provo, Utah
Pipe Sizes 2" thru 24"

Sales Offices

Provo, Utah	P. O. Box 18
Denver 2, Colo.	1921 Blake Street
Los Angeles 48, Cal.	6399 Wilshire Blvd.
San Francisco 4, Cal.	235 Montgomery St.
Portland 4, Oreg.	501 Portland Trust Bldg.
Salt Lake City	Waterworks Equip't. Co.
Seattle, Wash.	Smith Tower Bldg.

Fog-Tite Meter Seal

903

Fog-Tite Meter Seal Co., Seattle, Washington, has developed a new Fog-Tite Meter Seal, molded of transparent Tenite plastic, that offers a solution to water meter register problems. The clear Tenite forms a corrosion proof and practically unbreakable box which completely encloses the water meter register and change gears. The enclosure is filled with a non-freezing, transparent fluid. Installation of the seal is said to eliminate the usual troubles of condensation (fog) on register glasses, dirty faces and numerals, stuck or corroded registers. Meter reading may be sped up by as much as 50%, and reading errors are considerably reduced.

According to the manufacturer, the tough Tenite seal can be easily adapted to water meters already in service. It is shown here installed on a Trident meter.

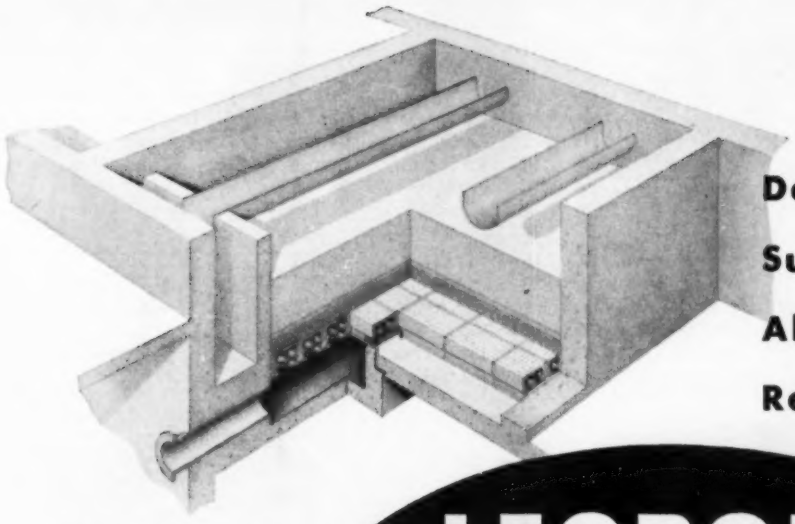
Carl H. Morken

T. S. Turkington

Kennedy Valve Promotes Two

Kennedy Valve Manufacturing Co., Elmira, N. Y., has announced that Carl H. Morken, formerly Works Manager, has been appointed Vice President in Charge of Manufacturing, and Thomas S. Turkington,

(*Continued on page* 102A)



Filter Unit Showing installation of Leopold Glazed Tile Filter Bottom

Designed to Successfully Meet All Underdrain Requirements...

LEOPOLD
Glazed Fire Clay
TILE FILTER BOTTOMS

Performance Proved in Over 200 Plants with a Daily Capacity of More Than 900 Million Gallons!

With its many exclusive advantages, the Leopold Compound Duplex Filter Bottom provides the most practical and economical answer to your underdrain problems.

In this design, laterals and distributing blocks are combined in one permanent unit that insures uniform filtration over the entire filter bed and equal distribution of the wash water with minimum loss of head. The individual blocks—each about two square feet in area and weighing approximately 100 pounds—are made of highest quality de-aired fire clay, vitrified and salt glazed. They resist corrosion, are not subject to tuberculation, won't absorb any detrimental amount of water, and are impervious to acids and alkalis.

Adaptable to any rectangular filter unit, the efficient Leopold Filter Bottom needs only a shallow depth of small sized filter gravel to support the filtering medium. Further, the Leopold design does not require special supporting concrete members or the added concrete construction of a false bottom.

Write today for complete details

F. B. LEOPOLD CO., INC.
2413 W. CARSON ST., PITTSBURGH 4, PA.

COMPLETE WATER PURIFICATION and SEWAGE PLANT EQUIPMENT
DRY CHEMICAL FEEDERS · FILTER OPERATING TABLES · MIXING EQUIPMENT

Controller, has been given the additional responsibility of Secretary.

Prior to joining the Kennedy firm in 1952, Mr. Morken was Plant Manager for Donovan, Inc., of St. Paul, Minn. He previously had been chief metallurgist for The Ohio Brass Company, at Mansfield, Ohio, foundry engineer and Eastern manager for the Detroit Electric Furnace Company, and general superintendent for the Carondelet Foundry Company, at St. Louis, Mo. He also spent several years in the foundry and manufacturing consulting practice.

Mr. Morken was graduated from the University of Minnesota in 1922 with a degree in Chemical Engineering. He has specialized in metallurgical and foundry work.

Mr. Turkington came to Kennedy Valve in 1945 as General Auditor, and was made Controller in 1950. Prior to that he was a supervising senior accountant with Miller, Donaldson and Company, of New York City. In that capacity he was in charge of the Kennedy Valve audit for several years.

Mr. Turkington was graduated from the Royal Belfast Academical Institute, the Belfast Municipal College of Technology, and the School of Accountancy. He spent a year in teaching, and then took up public accounting in Ireland, becoming a member of the Society of Accountants and Auditors. After coming to this country he spent 12 years with Warner Brothers Pictures, Inc., in various accounting and auditing capacities in the theatre department.

View at right shows cutaway section to illustrate construction and arrangement of interior working parts of M & H Gate Valve.

M & H Double-Disc Gate Valves Class "C" meet the latest specification of American Water Works Association. The iron body is heavily proportioned. Bonnet flanges are unusually strong. Body is designed with suitable guides to hold discs in alignment. Bronze seat rings are exceptionally heavy. The discs are seated or released by three-point action of the bronze spreaders, each operating independently of the other. There is no sliding or grinding between disc rings and body rings. Either of the two discs may be used on the down stream side of the valve. Discs are interchangeable, and so are the spreaders. For additional information, write or wire M & H VALVE AND FITTINGS COMPANY, ANNISTON, ALABAMA.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

Electro Magnetic Chemical Feeder Gives Infinite Increment Control

904

American Water Softener Company, Philadelphia, Pa., has developed a chemical feeder that proportions chemicals with mathematical accuracy. Available in both wet and dry types, the Company says no other chemical proportioner on the market today can compare with the American Electro-Magnetic Feeder for accuracy, simplicity, dependability or durability. The equipment is unconditionally guaranteed for 5 years.

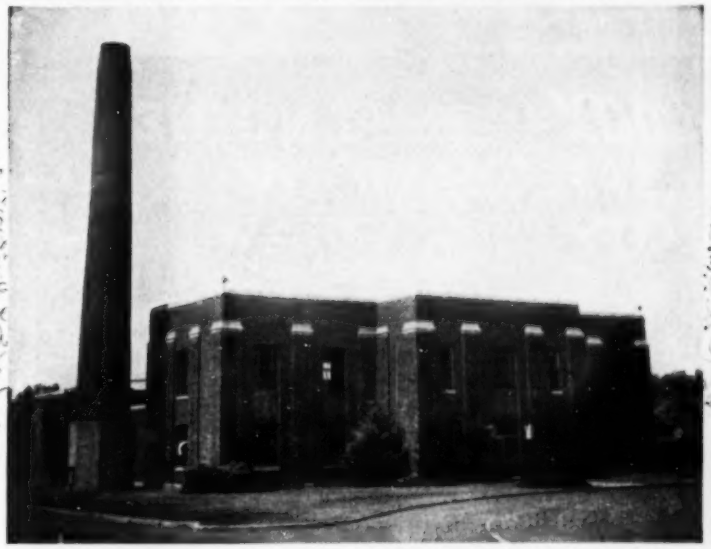
Infinite pawl engagement assures positive stepless control. Vernier adjustment gives micrometer control over chemical feed. Frequent impulses actuate a powerful solenoid entirely encased in a bronze housing. All working parts run in oil. Swing-pipe joints are non-binding.

The Electro-Magnetic Proportioner is the core of the American Chemical Feeder. It lowers the decanting draw-off at a controlled, adjustable rate in response to meter or contactor demand. On the acid feeder, an additional safety precaution is included to raise the draw-off automatically upon failure of current. The Proportioner is not in contact with the chemical and thus remains free from corrosion.

American also makes volumetric or graimetric dry chemical type feeders.

THE PRACTICAL ANSWER TO SLUDGE DISPOSAL

... AT SPRINGFIELD, MASSACHUSETTS



Havens and Emerson, *Consulting Engineers*

Twelve years ago, the Sewage Treatment Plant at Springfield, Mass., was placed in operation. The sludge disposal equipment was a C-E Raymond Flash Dryer Unit capable of handling over 3 tons of dry solids per 8-hour day.

Since its installation, this unit has operated on a 40-hour week schedule. In this entire time, there have been no shutdowns because of equipment failure.

In a typical year, the C-E Raymond Unit at Springfield flash dries and incinerates approximately 780 tons of dry solids. Incoming sewage contains approximately 213 parts per million of suspended solids. Removal, including grit, is about 61%.

The compact, flexible unit at Springfield, with its twelve years of successful service, highlights how effectively sewage sludge can be disposed of. This is true whether your community is small or large. To see how your locality, too, can be served with C-E Raymond Equipment, get in touch with the office nearest you. Addresses are listed below. B-685

INDUSTRIAL SLUDGES, TOO, are readily processed in C-E Raymond Equipment. Write for details.

COMBUSTION ENGINEERING, *Inc.*

FLASH DRYER DIVISION, 1315 North Branch Street, Chicago 22, Illinois

Western Office: 510 W. Sixth St., Los Angeles 14, Cal. ***Eastern Office:*** 200 Madison Ave., N. Y. 16, N. Y.

Lester Long

Lester Long Retires

American Cast Iron Pipe Company, Birmingham, Alabama, has announced that Lester Long, vice president in charge of sales and secretary, has retired after 38 years of continuous service with the Company. He was succeeded by A. J. Herrmann.

Mr. Long served as vice president in charge of sales and secretary of the Company since May, 1952. He was first employed at Acipco in the Experimental Department and worked in numerous other places in the plant and in the field before being transferred to the Sales Department in 1918. After several years in the Company's Sales Office in Dallas, Texas, he was transferred to the Los Angeles Office in 1927, returning to Birmingham in 1931 as assistant general sales manager. He was a member of the Board of Directors of the Company from 1947 to 1949 and has also served on the Board during the past year. During World War I, he served in the U.S. Army for two years, attaining the rank of lieutenant.

Born in Summit, New Jersey, Mr. Long is a graduate of Lafayette College.

8 (of 14) Climax 12 cylinder, 510 H.P. Gasoline Engines driving Peerless 48" Propeller Type Vertical Storm Water Pumps, each having a capacity of 45,000 GPM against a 28-ft. Head.

A NEW seven million dollar sewage disposal system, designed by and constructed under the supervision of Hubbell, Roth & Clark, Inc., Detroit, has recently been placed in operation for Saginaw, Michigan. Included in the system are five storm water pumping stations, two of which are equipped with a total of fourteen Peerless 48" propeller type vertical pumps, each having a rated capacity of 100 c.f.s. (45,000 GPM) All 14 are driven by Climax 12 cylinder, 510 H.P. gasoline engines. Reliable and independent power is provided as utility power failure is frequently caused by electrical and atmospheric disturbances associated with floods.

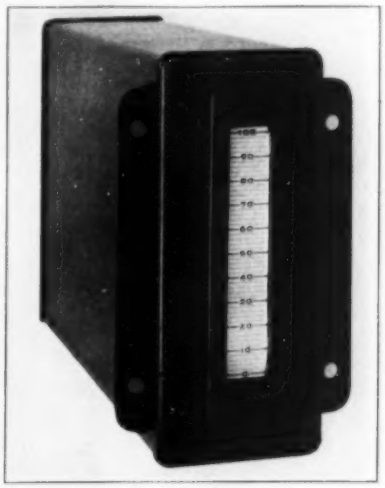
climax

FOR COMPLETE INFORMATION, WRITE TO . . .

ENGINE and PUMP MFG. CO.

FACTORY AND GENERAL OFFICE: CLINTON, IOWA

REGIONAL OFFICES: CHICAGO, ILL., DALLAS, TEXAS



Ribbon-Type Indicator For Graphic Panels

905

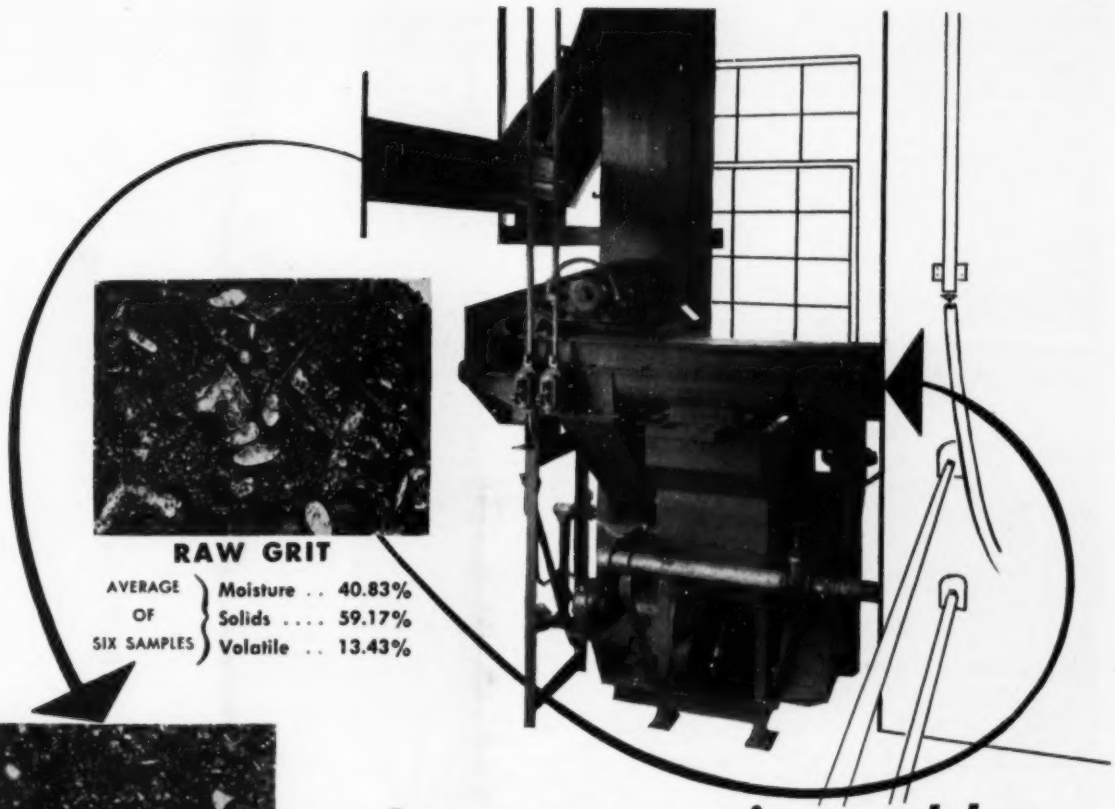
The Foxboro Company, Foxboro, Mass., has developed a new ribbon-type indicating receiver for graphic panel use. Added to the company's Consotrol line of compact instruments, the Model 50 Consotrol Indicator is especially suited to panel applications which require continuous indication of valve position or variables such as liquid level.

The indicator receives pneumatic measurements from a transmitter located at the process. This force is applied to a sensitive receiver bellows which, through a lever and stainless steel tape arrangement, rotates two lightweight drums. A brightly colored Nylon tape, wound on the drums, is thus drawn behind a glass pane on which scale graduations are printed. The clearly defined readings make internal illumination unnecessary, thus simplifying installation and reducing maintenance.

Since the indicator scale measures only ¾" by 4¼", the instrument fits easily into graphic panel symbols. All component parts are mounted on a removable chassis and protected by a housing which is secured to the back of the panel. The complete mechanism can be removed from its housing for service without disturbing the scale, case or panel. Zero, range and damping adjustments are then readily accessible.

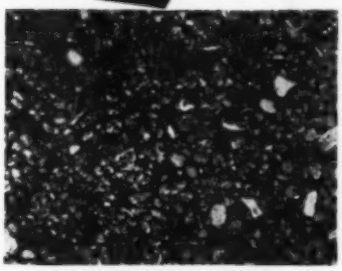
The instrument is available with

(*Continued on page* 106A)



RAW GRIT

AVERAGE OF SIX SAMPLES		
	Moisture . .	40.83%
	Solids	59.17%
	Volatile . .	13.43%



WASHED GRIT

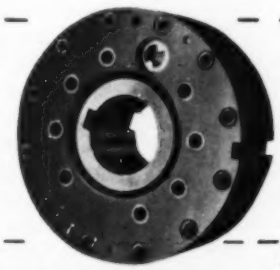
AVERAGE OF SIX SAMPLES		
	Moisture . .	20.22%
	Solids	79.78%
	Volatile . .	2.11%

solve your grit problem with JEFFREY "JIGRIT"

The Jeffrey "JIGRIT" Washer solves the disposal problems of odors, fly nuisance and burying expense. It produces an inoffensive washed grit that can be used for Fill, Road-ways, Walkways, etc. Grit channels, which are designed to settle out 65 mesh inorganic matter, settle out considerable organic matter, as well as make raw grit unsuited to open disposal. "JIGRIT" comes in three sizes: #1 (to 20 cu. ft. per hour); #4 (to 120 cu. ft. per hour); and #9 (to 280 cu. ft. per hour).

Investigate the Jeffrey "JIGRIT" now by writing for Cat. 833.

"HYDROLESE" PREVENTS OVERLOADS



The Jeffrey "HYDROLESE" Hub is big news in Sanitation Circles. It gives positive protection against overloads and eliminates troublesome shear pins. "HYDROLESE" can be: Adjusted to meet various load conditions . . . can be provided with visual warning . . . readily reset. It will not burn up. It carries a definite torque load (maximum of 20,000 lbs.) for speeds up to 20 R.P.M.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

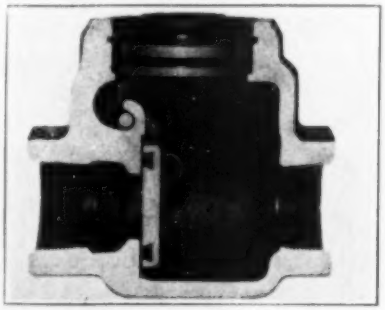
single or dual indicating scales and can be adjusted for direct or reverse response to measurement, as desired. Alarm contacts of the mercury switch type are optionally provided to produce various combinations of warning signals, depending on process needs.

Graver Appoints Honeck District Manager

Graver Water Conditioning Co., New York, N.Y., has announced the appointment of A. H. Honeck as District Manager in Cleveland and Cincinnati, Ohio.

Mr. Honeck is a graduate Mechanical Engineer, obtaining his degree from the Rochester Institute of Technology. He has worked in various departments at the Graver main office in New York City as a design, estimating and sales engineer since 1951. Prior to his connection with Graver, he was a research and development engineer, following several years as a plant engineer. During World War II, he served for three years with the U. S. Army Corps of Engineers.

In his new appointment, Mr. Honeck will maintain an office in Cleveland at 1103 Citizen's Building, and in Cincinnati at 3427 Corrine Ave., and his territory will include the entire state of Ohio and the northern counties of the state of Kentucky.



Swing Check Valves

906

Charles Wheatley Co., Tulsa, Okla., in collaboration with the Frank Wheatley Pump and Valve Co., has developed a new line of improved swing check valves.

The new Streamflo synthetic seal check valve, which weighs fifty per cent less than the standard check valve, is full pipe opening allowing ample scraper room.

A revolutionary feature is the O-ring-sealed bonnet, secured by a snap-ring instead of a heavy and slow flange. There is no pin through the body for the clapper linkage, eliminating possible leakage. Removing the bonnet automatically releases the clapper for quick inspection. In addition, the seal, dovetailed into the clapper, gives a positive seal on only one pound pressure differential.

One line in cast iron handles pressures up to 300 lbs. and the other in steel handles pressures from 300 to 1200 lbs.

Both the steel and cast iron valves are made in the screwed ends and flanged ends and a special valve in the steel has beveled ends to permit welding directly into the line or for welding neck flanges.

Executive Elections at Hardinge

Hardinge Company, Inc., York, Pa., has announced the election, by the board of directors, of John J. Cadot as executive vice-president and Robert J. Russell as vice-president in charge of sales.

Mr. Cadot continues in his capacity as treasurer and works manager, and Mr. Russell remains corporation secretary and sales manager. At the same meeting Isabel R. Childs was newly elected assistant secretary of the corporation.

JC-60 SEWER JOINTS
. . . actually turn roots away

An ordinary root may exert pressure as high as 50 psi at the tip. Thus, it is easy to understand why roots are a common cause of sewer line destruction . . . and why foresighted engineers specify ATLAS JC-60®, the synthetic plastic base, *root resistant* jointing compound.

Roots cannot penetrate the surface of a JC-60 joint. JC-60 is hard . . . so hard it forces roots to change direction. At the same time, *high adhesion of JC-60 prevents roots from entering between the pipe and the compound.* Even at maximum pressure, ordinary roots cannot break the tight bond that JC-60 provides at the joint interfaces.

Furthermore, JC-60 *retains* this combination of characteristics. Even after hours of overheating in the melting pot or pouring under adverse conditions, properly poured ATLAS JC-60 still provides tight, root-proof joints that withstand normal settling without failure . . . reduce infiltration and exfiltration to a minimum . . . resist chemical and bacterial attack.

FOR COMPLETE FACTS . . . Send for Bulletin M20-3.

ATLAS JOINTING COMPOUNDS
. . . a permanent bond

OTHER ATLAS PIPE JOINTING MATERIALS *include* **GK®** *and* **SLIPJOINT GK®** *for sewers* **. . . MINERALEAD®** *and* **HYDRORINGS®** *for cast iron water pipe.*

ATLAS MINERAL PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

Engineering Representatives Throughout the United States

FOND DU LAC, WISCONSIN USES WALKER PROCESS CIRCULAR COLLECTORS

To Provide Continuous Treatment of Large Volumes of Domestic and Industrial Tanning Wastes

ENGINEERS: JERRY DONAHUE ENGINEERING CO.
Sheboygan, Wisconsin
SUPERINTENDENT: CLARENCE W. BOGENNAGEN

Fond-du-Lac had the problem of treating a combination of domestic waste and a large volume of industrial wastes including a considerable percentage of tannery waste. Three of the four Walker Process Primary and Final Circular Collectors used at this plant are visible in the foreground of the above photograph. Also shown are two Walker Process Rotary Distributors.

Each Circular Collector is 104 feet in diameter. Each distributor is 120 feet in diameter. This installation has completely solved the waste treatment problem for Fond-du-Lac.

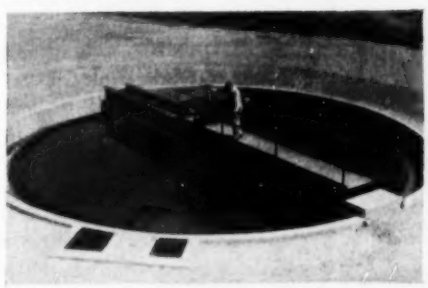
Walker Process offers three types of Circular Collectors to suit varying requirements at the lowest practical investment.

The Fond-du-Lac collectors are all Tractor Drive units. The drive is located at the end of a rotating bridge which acts as a lever arm to drive the center cage and collector arms.

Where the access bridge must be stationary or where corners of square tanks must be scraped, the Walker Process pier supported Collector or the bridge supported Collector is used.

WRITE FOR BULLETIN NO. 9W65

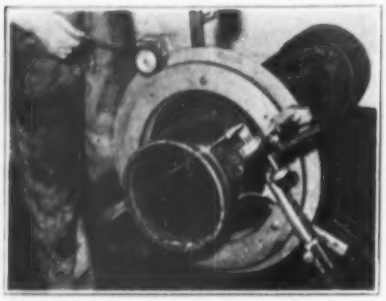
Walker Process Pier Supported Collector Installation — Aurora, Colorado, Engineers — Phillips-Carter Osborn, Inc., Denver, Colorado.



Walker Process Bridge Supported Collector Installation — Elizabethtown, Pa. Engineers — Gannett, Fleming, Cordry & Carpenter, Harrisburg, Pa.

WALKER PROCESS **WALKER PROCESS EQUIPMENT INC.**
FACTORY • ENGINEERING OFFICES • LABORATORIES
AURORA • ILLINOIS

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.



Acetylene Pipe Cutter

907

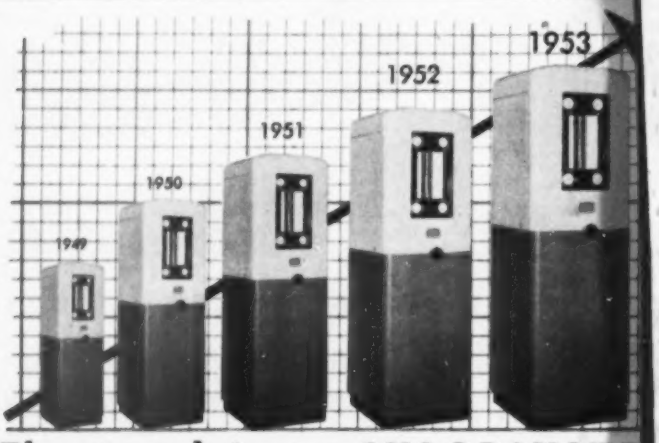
Springload Mfg. Corp., Seattle, Wash., has developed a new acetylene torch cutter which cuts and bevels steel pipe with absolute accuracy in one and a half minutes.

The new torch cutter has a traveling carriage attachment and clamp which holds the torch in a fixed position in relation to the pipe as it rotates. The machine is designed to keep the torch at a proper distance and angle and is so mounted on a precision universal chuck that it holds within 1/64" of accuracy. A hand operated crank is used to advance the torch.

A one-man tool, the Springload acetylene torch will cut 10" pipe in approximately two minutes, with absolutely even cut and bevel all around the pipe. It comes in two sizes—4" to 12", and 12" to 20".

Newquist Appointed President of Roots-Connersville

Roots-Connersville Blower Div., of Dresser Industries, Connersville, Ind., has announced the appointment



The trend is to CHLORINIZE

The idea of feeding and metering chlorine gas in its c non-corrosive state has caught on. Time and again, Build Visible Flow Chlorinizer has been selected over other mak and types of chlorine gas feeders. Why?

1 — Because the Chlorinizer does not subject vital control a metering components to moist, corrosive chlorine gas . . . this means less maintenance and lower operating expense.

2 — Because the Chlorinizer has a direct reading, positive "visible-flow" indicator — the Sightflo Indicator.

3 — Because the Chlorinizer is extremely easy to change from one capacity range to another, or from manual operation to automatic or flow-proportional operating systems.

4 — Because the Chlorinizer does NOT give off obnoxious chlorine fumes — the tray water is free of strong chlorine odors.

Send today for descriptive Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries), 350 Harris Ave., Providence 1, Rhode Island.

BUILDERS PROVIDENCE *Instruments*

B-I-F INDUSTRIES — BUILDERS

WAY

PAG

Small, Inexpensive Ditching Machine

908

The Charles Machine Works, Perry, Okla., has developed a small, inexpensive, yet effective, ditching machine, which they call the Ditch Witch.

The Ditch Witch is simple in design and said to cost only one-tenth as much as the average large ditching machine. It is small enough to be hauled in a pick up truck, yet is powerful enough to cut a trench 4½ inches wide and 30 inches deep through almost all types of soil.

The standard model DW ditcher is powered by a 6 h.p. Wisconsin air-cooled engine mounted on a 1020 formed steel and tubular frame. The self-cleaning bucket-digger teeth are arranged in varying positions to give

a milling effect as it progresses and prevent tearing of the soil.

Another feature of the Ditch Witches is their utilization of standard parts. The hydraulic system on the bucket-digger assembly is a modified jack mechanism. The 4.00 x 8 tires are standard farm implement size, and the steering components are also standard.

The largest model (E) is powered by a 12 h.p. engine and employs a hydraulic drive, which varies the crowd of the digging chain against the front of the trench. With the model E a 4½ or 6 inch width and 24 to 42 inch depth trench can be

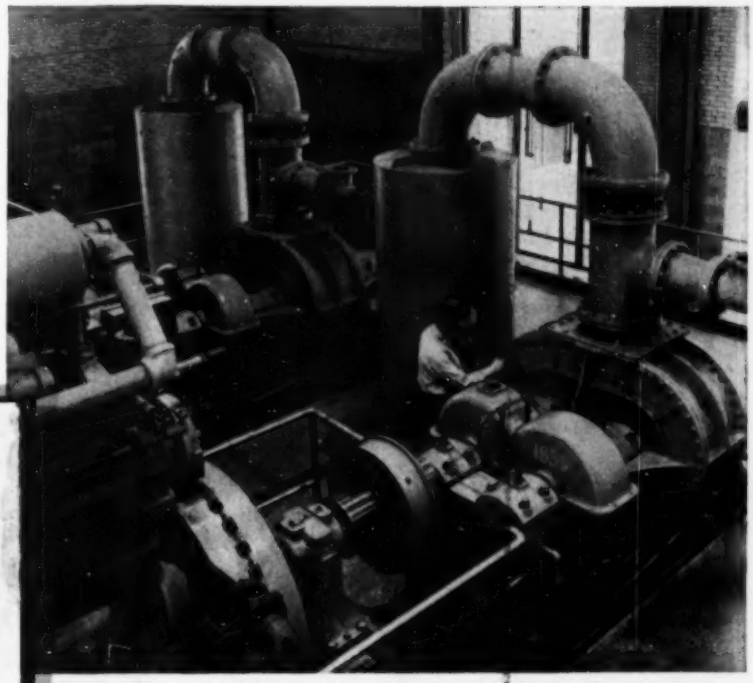
VY

GES

turbidity, color and organic matter from water supplies; (2) to chlorinate; (3) to remove bad tastes and odors; (4) to remove iron and manganese; (5) to neutralize; (6) to soften and (7) to de-alkalize.

The plant, as a complete package, forms an extremely versatile and self-contained unit which is available in eight standard sizes ranging from 500 to 3,300 gallons per hour and flows of 12,000 to 79,200 gallons per 24 hours. Larger capacities can be furnished on request.

Each complete water conditioner consists of a Precipitator with a built-in clearwell, a proportioning chemical feeder control, a coagulant feeder tank, a lime or soda ash and hypochlorite feeder tank, an inlet float control valve, Neutralite filter unit(s), Carbo-Dur purifier unit(s) and a service pump.



ecent installation of two R-C Rotary Positive Blowers in Northeast Sewage Treatment Plant. Capacity of each unit is 5,000 cfm.

ONSULT THE "Specialists" ON BLOWER PROBLEMS

One of the many reasons why Roots-Connersville Blowers are such prime favorites among sewage treatment engineers is their unquestioned reliability. In small plants, with only intermittent or part-time attendants, this is of prime importance. For installations handling large volumes, even a temporary breakdown could have serious results.

Another factor contributing to the popularity of R-C equipment is the *dual choice* provided by the exclusive *dual-ability line* of both Rotary Positive and Centrifugal designs. Because we build both, R-C Specialists have no prejudices—they can recommend whichever type is best suited to the specific job to be done.

The long-time, satisfactory performance of R-C installations comes from almost a century of specialized experience in handling air and gas. We have no other business—our time and facilities are 100% devoted to designing and building blowers, meters, gas pumps and related equipment. Much of this experience is in the sewage treatment field, in which we have more installations than any other company. So, when you have a problem of blowers, for new plants or for replacements, we suggest you call on the "Specialists" who are always at your service.

ROOTS-CONNERSVILLE
Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER A DIVISION OF DRESSER INDUSTRIES, INC. 535 Mount Ave. • Connersville, Indiana

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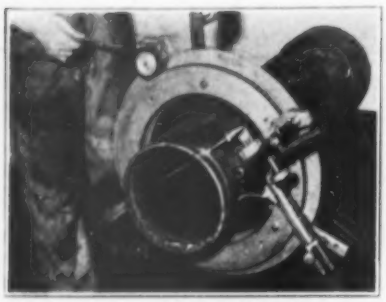

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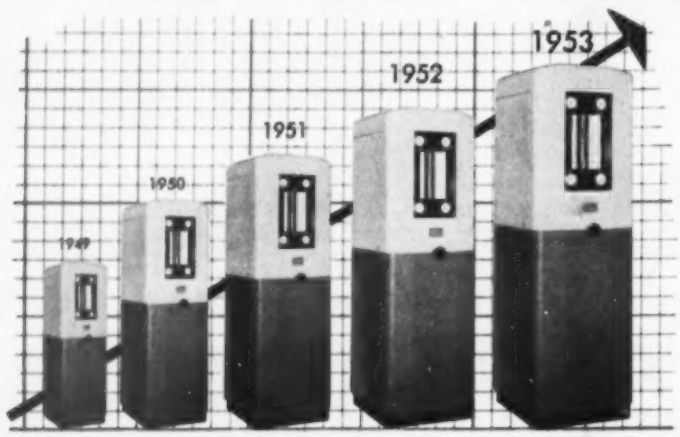
Roots-Connersville Blower Div., of Dresser Industries, Connersville, Ind., has announced the appointment of Ralph R. Newquist as President and General Manager of the Roots-Connersville Blower Division. He succeeds R. H. Owens who becomes Chairman until his retirement later this year.

Newquist, a graduate of Pennsylvania State College, came to Roots-Connersville in 1946 as Vice President in Charge of Sales. Since 1951 he has been Executive Vice President. Before joining Roots-Connersville, he was manager of the Washington, D. C. office for Allis-Chalmers Manufacturing Company.



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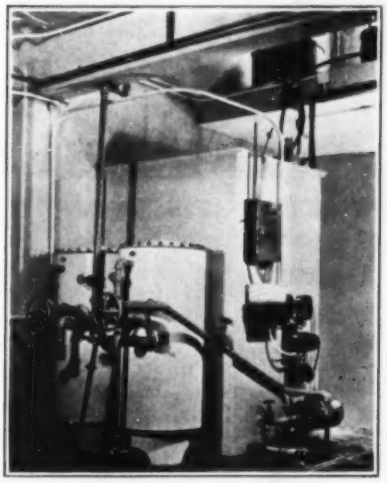

Package Water Conditioner

909

Permutit Company, New York, N.Y., has developed a Package Water Conditioning Plant.

These units, without any alterations, may be used: (1) to remove turbidity, color and organic matter from water supplies; (2) to chlorinate; (3) to remove bad tastes and odors; (4) to remove iron and manganese; (5) to neutralize; (6) to soften and (7) to de-alkalize.

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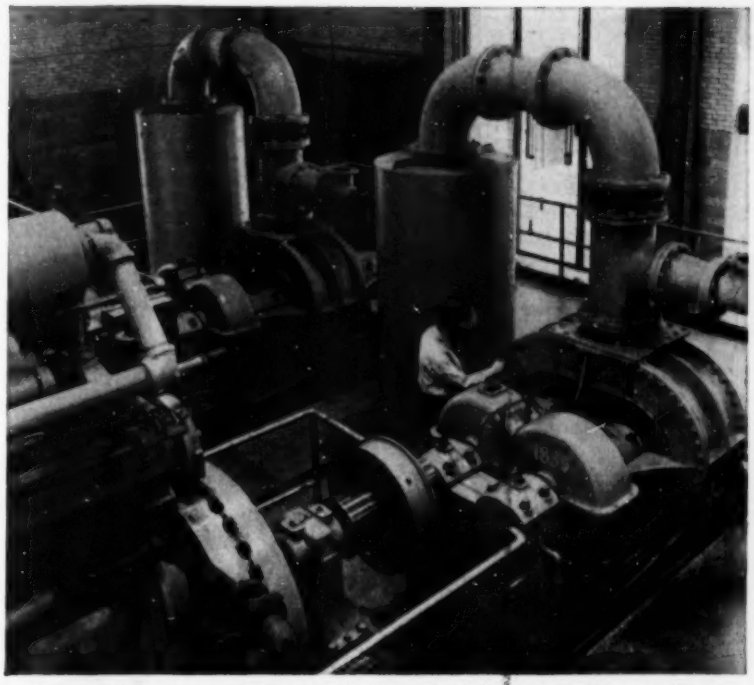

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A DIVISION OF DRESSER INDUSTRIES, INC.
525 Mount Ave. • Connersville, Indiana

W. F. Rockwell, Jr., Honored by Pittsburgh Citation

Willard F. Rockwell, Jr., 39-year-old president of Rockwell Manufacturing Company, was recently selected as one of Pittsburgh's "100 Outstanding Young Men" by a committee of civic leaders. The 100 were chosen on the basis of accomplishments to date in their respective fields as well as their civic contributions and "future promise."

Mr. Rockwell was one of 23 men representing industry on the list, which included practically all major fields of human endeavor, with the exception of agriculture. The 100 were picked from 1,300 nominees and a committee of 25, headed by Dr. J. C. Warner, president of Carnegie Institute of Technology, did the final judging.

Pipe Stop

910

The Triangle Jack Co., Inc., Wichita, Kansas, has developed the LEDO Pipe Stop for the safe, orderly and economical racking of pipe.

The pipe stop is intended to be nailed to the wood runner under a layer of pipe, to hold the outside joints from rolling. It is designed so that the more pressure applied against it, the deeper the teeth sink into the wood runner and the stronger it becomes. A lip on the back side makes it easy to remove with a hammer or pinch bar. Of sturdy steel construction it can be used over and over without bending or losing its effectiveness.

Lundie Elected President of Johnston Pump

Johnston Pump Co., Pasadena, Calif., has announced that Kenneth G. Lundie, vice president in charge of sales, has been elected president of the Johnston Pump Company of New Mexico and Johnston Pump Company of Fresno. Headquarters for the former are in Roswell, New Mexico, and for the latter in Fresno, California.

In assuming his new posts, Lundie rises to his present position as the result of many years of association with the pump industry. For over thirty-five years Lundie has been active in such fields as merchandising, sales promotion, sales management, and distribution of pumps. His activities have won for him respect and recognition by the entire industry.

Strainers for Submersible Pumps

911

Cook Well Strainer Co., Cincinnati, Ohio, has developed a well strainer that prevents the possibility of a sand lock.

The company states that the exclusive V-shaped, self-cleaning slot larger inside than out, eliminates the possibility of clogging, permits flow of water with minimum friction loss.

Cook well strainers are available in red brass, Anaconda Everdur, Armco Iron, or stainless steel, in as many different size slots as required.

"O" RING SEAL REPLACING CONVENTIONAL PACKING
1. BRONZE SLEEVED STEM 2. O RING DIRT SEAL 3. O RING PRESSURE SEAL 4. O RING SEAL PLATE
SMITH HYDRANTS
WITH "O" RING SEAL
"O" Rings replace conventional packing and reduce maintenance to a minimum. The lower "O" Ring is the pressure seal, the upper "O" Ring the dirt seal. The specially compounded rubber plastic "O" Rings do not deteriorate and insure a long life pressure seal.
All Smith Hydrants including Hydrants in service can be fitted with "O" Ring Seal Plates. Write for details.
THE A.P. SMITH MFG. CO.
EAST ORANGE, NEW JERSEY

Bailey Meter Appoints Gorrie Chief Engineer

Bailey Meter Company, Cleveland, Ohio, has announced that H. H. Gorrie, assistant chief engineer, has been appointed chief engineer, directly in charge of the company's engineering activities.

Gorrie, who started with Bailey Meter Company in 1927, became assistant chief engineer in 1944. He is a graduate of Rensselaer Polytechnic Institute, Troy, N.Y.

Coleman Model 8 Colorimeter

912

Coleman Instruments, Inc., Maywood, Ill., has announced a completely new offering of its Model 8 Photo-Electric Colorimeter, with new power supply arrangements, revised combinations of accessory equipment and a lowered price schedule.

According to the company the Coleman Photo-Electric Colorimeter is characterized by a group of unique features heretofore available only in Spectrophotometers. These include:

1. The Coleman system of cuvettes and adapters which allow instant choice of any of 9 cuvette sizes, with minimum sample volumes ranging from 10 ml. to 0.007 ml.

2. Interchangeable galvanometer scale panels allowing direct readings

STEVENS

TYPE B-FT RECORDER PROVIDES PERMANENT DATA ON SEWAGE FLOW

At this modern sewage treatment plant in Dallas, Oregon, the STEVENS Type B-FT Recorder provides a permanent graphic record of flow in million gallons per day (range 0-6 MGD) and totalizes the volume in gallons. The STEVENS Recorder is mounted over a stilling well connected to a 9" throat width Parshall flume.

record flow accurately... automatically

There is good reason why modern municipal sewage and industrial waste measuring installations use the STEVENS Type B Recorder. It may be wall, pedestal or panel mounted, is easily operated and will give a lifetime of accurate, trouble-free service. This Recorder uses a circular chart which makes one revolution per day or per seven days, as specified, while the pen swings in an arc around an external center—the combined movements thereby producing a graph of the rate of flow (or head) against time. Volume is indicated on a counter-type totalizer. Accuracy of the registration is limited only by the accuracy of the rating to which the totalizer is set. Flow or head (or both) may be indicated on a scale clearly visible through a large glass port.

RECORDS FLOW
RECORDS HEAD
TOTALIZES FLOW
Direct Float Operated or Remotely Controlled

To find out more about the STEVENS Type B Recorder, and how it can simplify the task of compiling accurate flow records, write for FREE Bulletin 25.

SEND FOR NEW STEVENS DATA BOOK

Puts interpretive data at your finger tips. 144 pages of technical data... information on float wells and recorder installations... a wealth of hydraulic tables and conversion tables.

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Foremost in Precision Hydraulic Instruments Since 1907

LEUPOLD & STEVENS INSTRUMENTS, INC.

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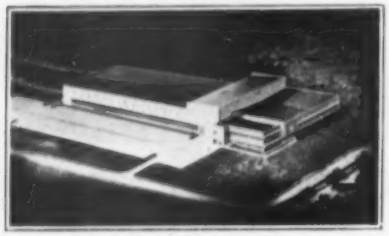
in terms of Optical Density, Transmittance or constituent concentrations.

3, 4 ways to measure with dual measuring system. Both Optical Density and % Transmittance readings by either of two methods—instant, direct-reflection readings from the illuminated galvanometer scale, for speed and convenience; null-point readings from the calibrated slide-wire potentiometer, for the highest possible precision.



Link-Belt Opens New Canadian Plant

Link-Belt Company, Chicago, Ill., has announced the opening of the new Link-Belt Limited plant at Scarboro, Ont. The plant was designed to increase greatly the company's capacity for design and fabrication of conveying, processing and engineering equipment. This 72,000-square-foot plant is on a 20-acre tract which permits expansion to several times its present size.

Headquarters for Link-Belt Limited, including general offices, engineering, purchasing, order, accounting and Ontario district sales, are now located at this plant. These new Scarboro facilities permit immediate expansion of the manufacture of conveyor and power transmission components at the company's Eastern Avenue plant in Toronto, as a result of moving all steel fabrication and heavy assembly work to the new plant.

Inexpensive Soil Reaction Tester

913

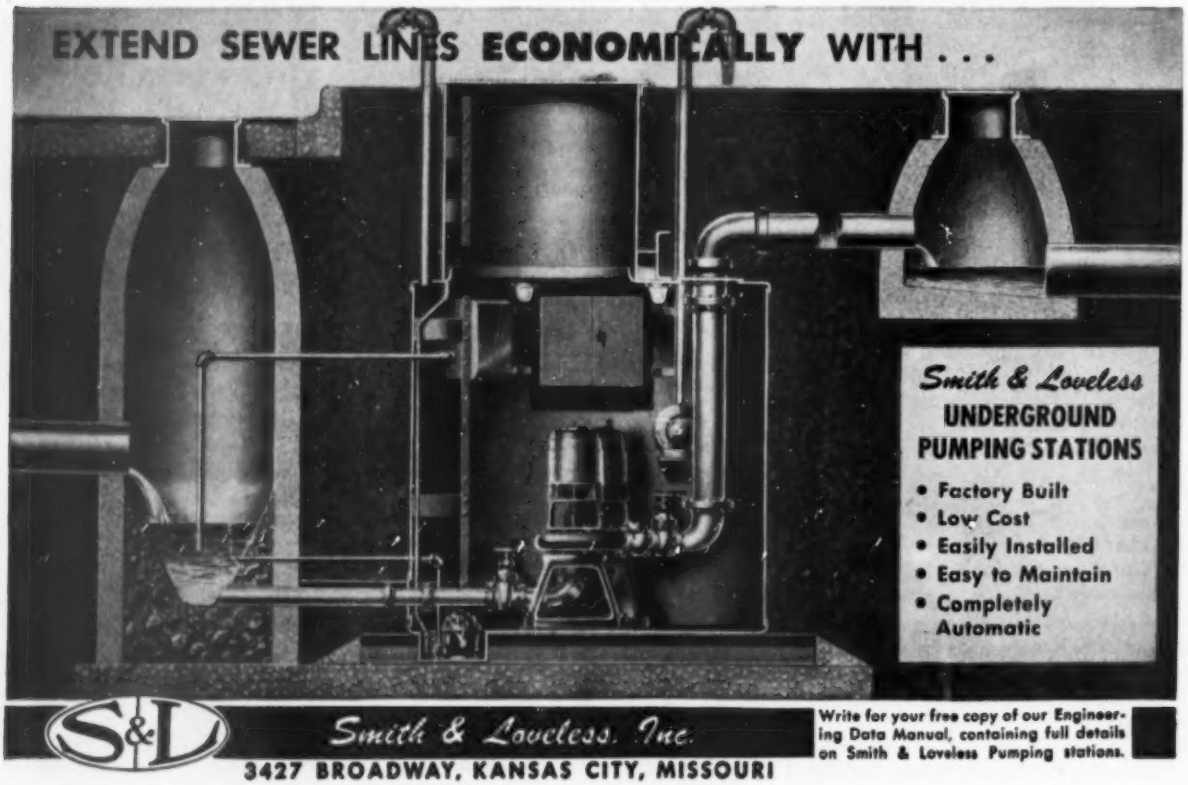
Hellige, Inc., Garden City, N.Y., has just placed on the market an inexpensive Soil Reaction Tester. The Tester is provided with an accurate color comparison scale permanently processed into the test plate for ease of operation. The color scale is located conveniently on either side of the channel of the test plate to facilitate accurate comparison with the indicator.

Clearly differentiated colors represent pH 4 to 9 (highly acid to strongly alkaline reactions). The simple three-step procedure is foolproof, and soiled or lost color charts are never a problem.

Amercoat Expands and Relocates Houston Office

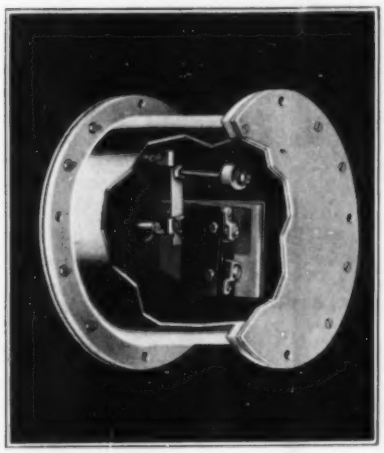
Amercoat Corporation, South Gate, Calif., has relocated its branch offices and warehouses in new and larger quarters at Houston, Texas.

The new branch offices, opened June 1, are located at 6530 Supply Row in Houston's expanding Supply Row Center industrial area where many other national firms have re-


EXTEND SEWER LINES ECONOMICALLY WITH . . .
Smith & Loveless
UNDERGROUND PUMPING STATIONS
• Factory Built
• Low Cost
• Easily Installed
• Easy to Maintain
• Completely Automatic
S&L
Smith & Loveless, Inc.
3427 BROADWAY, KANSAS CITY, MISSOURI
Write for your free copy of our Engineering Data Manual, containing full details on Smith & Loveless Pumping stations.

cently established facilities to better serve the growing southern industrial market.

Lucien L. Miner, Amercoat District Manager, will be in charge of operations at the new location. Amercoat formerly maintained its south central branch at Dallas. The company's home office and plant are located at South Gate, California. Additional offices and warehouses are maintained at Chicago, Illinois; Newark, New Jersey, and Jacksonville, Florida.



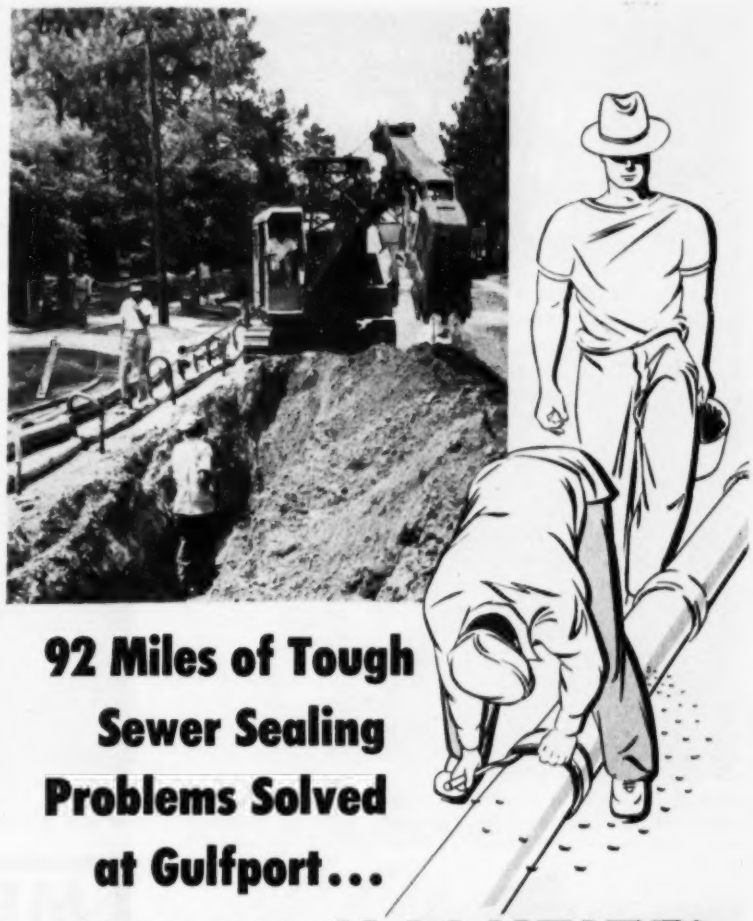
Bantam Bin-Dicator

914

The Bin-Dicator Co., Detroit, Mich., has introduced an all-new, lower-priced model in the popular Bantam Bin-Dicator, bin level indicator.

The small size Bantam Bin-Dicator was originally introduced to meet the demand for a unit which could be installed in hoppers, bins, chutes, etc., where installation space was too limited to permit the use of the larger, standard model Bin-Dicators. The new model is a refinement of the original model and offers even wider versatility and a lower price.

Over-all diameter of the new Bantam is but 5¾", and the housing is so designed that it may be mounted on the *outside* of thin-walled bins, *inside* of thick-walled or multiple compartment bins, or *suspended within* bins. It is thus adaptable to practically any necessary mounting arrangement and its small size makes it usable on and in containers of limited size. The 4" flexible diaphragm is ample for the requirements of such containers, and various types of diaphragm material are available, making the Bantam applicable to practically any free-flowing bulk material.



92 Miles of Tough Sewer Sealing Problems Solved at Gulfport...

with cold applied **KALKTITE®**

Gulfport, Miss., recently tackled its first complete sanitary sewer system . . . 485,000 ft. of 6" to 36" pipe laid under very difficult construction conditions . . . normal ground water level averaging approximately 18" below ground and subsoil consisting of fine white sand. Every lineal foot of trench had to be de-watered by an elaborate well point system operating continuously.

Presstite's KALKTITE compound was selected to seal the sewer joints under these tough conditions because it is . . .

- ***mixed and applied cold*** on the job.
- ***so highly adhesive*** to the pipe that it makes tight joints even under adverse pipe laying conditions.
- ***tough and flexible,*** allowing for normal sewer line settlement and some alignment deflection during backfilling.
- ***unaffected by acids,*** gases and alkalies of sanitary sewers and contains an ingredient poisonous to vegetation and tree roots.
- ***economical to use,*** allowing installation of more joints per man, per hour, per day.

The engineers' check for water infiltration shows the bulk of the lines have such negligible infiltration that no infiltration tests were necessary.

PRESSTITE Sealing Compounds

Write today for more detailed information on the superior qualities of cold applied KALKTITE sewer joint sealing compound.

PRESSTITE ENGINEERING COMPANY

3780 Chouteau Ave. St. Louis 10, Missouri

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Koppers Appoints Wheeley Southern Sales Manager

Koppers Co., Pittsburgh, Pa., has announced the promotion of B. Otto Wheeley to the position of Southern District Sales Manager for the Tar Products Division.

Mr. Wheeley, who has been Assistant District Manager, with headquarters in Birmingham, Ala., succeeds F. G. Owen, who died June 21 after a long and prominent career in Birmingham industrial and civic affairs.

A native of Lafayette, Tenn., Mr. Wheeley was graduated from the University of Tennessee with a Bachelor of Science degree in Chemical Engineering and joined Koppers in 1943 as a cadet engineer. In the 10 years since then, he has been promoted consistently, being an administrative assistant, assistant to District Manager and Assistant District Sales Manager.

Corrosion Resistant Tanks

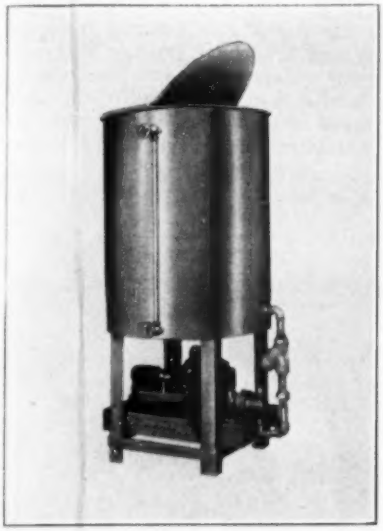
American Agile Corp., Bedford, Ohio, has developed corrosion-resistant tanks, fabricated throughout from Agilide (unplasticized polyvinyl chloride).

The tanks are mainly of welded construction, entirely self-supporting and therefore offer resistance to corrosion on the interior as well as the exterior of the tank. Resistant to most mineral acids, alkalis, inorganic salts, and a large number of organic compounds at temperatures up to 170° F., they are built to customer's specifications. Tanks are furnished complete with Agilide inlets and outlets and standard flanged fittings to permit incorporation into existing or new installations.

Bessen Joins Komline-Sanderson Sales Staff

Komline - Sanderson Engineering Corporation, Peapack, New Jersey, has announced the appointment of S. X. Bessen as Sales Engineer.

Mr. Bessen is a Sanitary Engineering graduate of Massachusetts Institute of Technology. He was formerly associated with Oliver United Filters, Inc., and prior to that, with Chicago Pump Company.



Packaged Chemical Feed Unit

915

Philadelphia Pump & Machinery Co., Wynnewood, Pa., has developed a packaged chemical feed unit. The

MEXICO CITY
Modernizes With
FLEXIBLES!

Places Largest Order
FOR SEWER-CLEANING EQUIPMENT
In History!

Above is a "partial shipment," shown with operators. Modern city administrations everywhere are invited to write for the FACTS ABOUT "FLEXIBLES."

The progressive new present administration of Mexico City was appointed by the President of Mexico on it's pledge to remedy past negligence. One of its first steps was to order more than $297,000 worth of Flexible Sewer-Cleaning equipment to clean and maintain its more than 9,000 miles of sewer, some of which is over 300 years old. Twenty-five freight cars were required to ship the 170 Flexible Bucket Machines, cables, rods, buckets, etc. in this—"the world's largest order of its kind." Flexible equipment was selected after careful and scientific investigation and thorough demonstration!

Flexible SEWER-ROD EQUIPMENT CO.
9059 VENICE BOULEVARD, LOS ANGELES 34, CALIF.
(BRANCHES IN PRINCIPAL CITIES)

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS AND EQUIPMENT

unit is a self-contained assembly comprising a sturdy welded steel chemical solution tank of 50 or 100 gallons capacity mounted above a controlled capacity pump. It is completely piped, ready for connections to the plant chemical feed piping, and to the electrical control equipment, whether manual or automatic. Unit operates directly from available electrical circuits. It is supplied with sight gage and special stainless steel strainer between pump and tank.

Mechanical agitators can be provided to provide vertical agitation rather than the usual horizontal type. Controlled capacity pumps are available in either simplex or duplex types with foolproof, spring-loaded, double-ball valves of stainless steel or special alloys.

The simple, low-cost drive comprises a standard speed reducer and motor assembly—both products of leading manufacturers with nation-wide sales and service facilities.

Colebaugh to Sales Staff of Industrial Chemical

Industrial Chemical Sales Division, New York, N.Y., has announced that David C. Colebaugh, Jr., research chemist in the Nuchar Research Laboratory of West Virginia Pulp and Paper Company in Tyrone, Pa., has been assigned to the Chicago sales staff of the company.

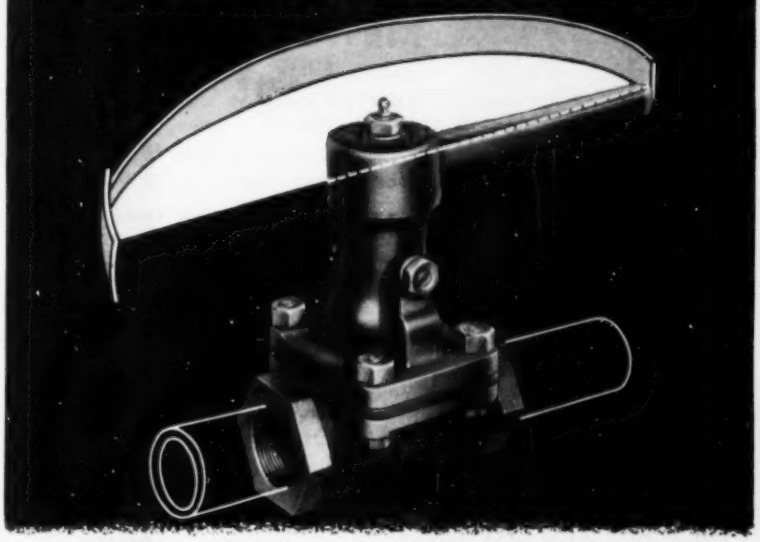
In his new position Mr. Colebaugh will assist John Zieserl, manager of the Chicago sales office, in servicing the company's active carbon, tall oil and lignin accounts in the Midwest.

Mr. Colebaugh has spent more than seven years in all phases of active carbon research and development since coming with the company in 1945. He has traveled extensively throughout the country demonstrating technical applications of active carbon in the water purification field.

A native of Altoona, Pa., Mr. Colebaugh was graduated from Franklin and Marshall College in 1942 with a B.S. degree in chemistry. He was associated with Hercules Powder Company before joining West Virginia Pulp and Paper Company.

with this corrosion resistant valve . . .

YOU GO FROM FULL OPEN TO FULL CLOSED IN A 180° SWING OF THE LEVER



HILLS-McCANNA

Quick Opening

SAUNDERS PATENT DIAPHRAGM VALVES

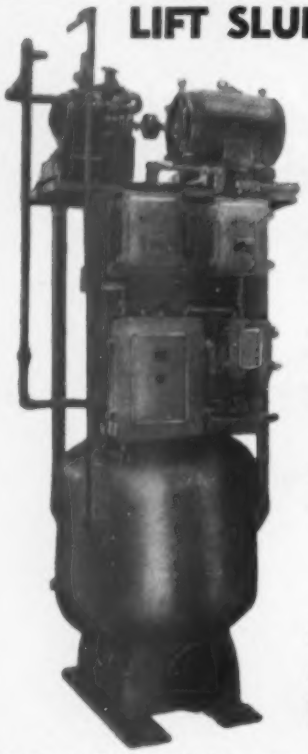
Where you must combine the ability to handle tough services with quick opening—quick closing characteristics, Hills-McCanna Lever operated Diaphragm Valves are the answer. The lever action is smooth and positive. An adjustment for holding the handle in an intermediate position provides throttling when required. Available with choice of fifteen diaghragm materials including rubber, neoprene, polyethylene, Kel-F and Teflon. Choice of over fifty body materials that include rubber, glass, lead, and plastic linings, any machinable alloy and plastics. Dependent upon materials and size, Hills-McCanna Saunders Patent Valves are suitable for temperatures to 400°F., pressures to 150 psi. Write for descriptive literature. HILLS-McCANNA CO., 2357 W. Nelson St., Chicago 18, Illinois.

HILLS-McCANNA

saunders patent diaphragm valves

Also Manufacturers of Proportioning Pumps
Force Feed Lubricators • Magnesium Alloy Sand Castings

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.



Compact ejector system having motor compressor assembly and all controls in one "packaged" unit.

LIFT SLUDGE AND SEWAGE

.. Unfailingly .. With Rugged, Dependable

BLACKBURN-SMITH PNEUMATIC SEWAGE EJECTORS

Obviate complex piping for air and water. Eliminate clogging of screens, impellers, and shredders.

30 to 500 GPM in both single and twin units against high discharge heads.

Exclusive Modern Features

Over 50 years service has proved the worth of Blackburn-Smith Ejectors. Yet our today's product is full of exclusive modern features such as:

1. Float and electrical float switch controls.
2. Float and pneumatically controlled snap action valve.
3. Electrode controls.

Any one of the above, with or without Air Receivers. Get Catalog S.

REPRESENTATIVES WANTED. ADDRESS:

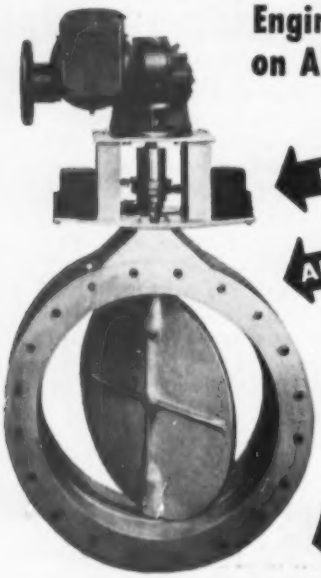
Blackburn-Smith Mfg. Co. Inc.

98 River St., Hoboken, N. J.

Phones: HOboken 3-4425 REctor 2-9360

W. S. ROCKWELL VALVES

Engineered for Dependable Service on Air, Gases, Liquids, Semi-Solids



FULL FLOW with minimum pressure drop.

ANY CONDITIONS of commercial, drip- or bubble-tight closure, with quick, positive control and shut-off manually or automatically.

RESISTANT Made ruggedly for all conditions of corrosion, erosion, temperatures to 2000° F., pressures to 300 p.s.i.

ALL TYPES Butterfly, wafer or slide .. valves, 1" to 120" pipe size.

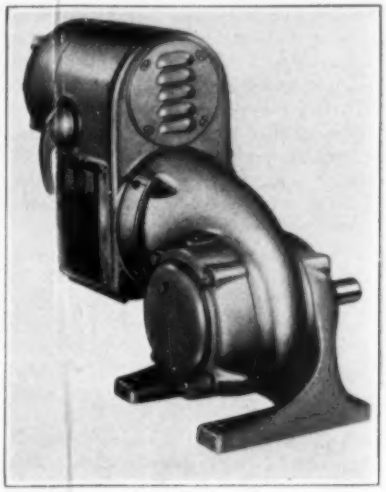
W. S. ROCKWELL COMPANY

ROCKWELL SINCE 1888 BUILT

BUTTERFLY VALVES • SLIDE VALVES • AUTOMATIC VALVES

2763 ELIOT STREET • FAIRFIELD, CONN.

Sales Representatives in Principal Cities



F.H.P. Varidrive With Right-Angle Syncrogear

916

U. S. Electrical Motors, Inc., Los Angeles, Calif., has announced the development of fractional horsepower Varidrive motors in combination with right-angle Syncrogears. Designed for applications requiring low, variable speeds with a compact, right-angle hook-up, this Varidrive-Syncrogear motor, called type VA-GW, is offered in ¼, ⅓, ½ and ¾ H.P. with speed variations up to 10:1.

These units offer maximum compactness and suitability to such applications as conveyors—especially since most of the Syncrogear worm-gear ratios are self-locking when not in use. The full range of speeds is achieved merely by turning the conveniently located control handle within an arc of 300°. Because the variable speed transmission is of the V-belt type, speed changes as slight as 1 rpm may be effected while the motor is operating.

The Syncrogear employs the cantilever principle of mounting all parts on a sturdy, pyramidal base. There is no transmission of mounting stresses through the unit, normally caused by separated mounting castings. Gear and bearing alignment remain permanently accurate.

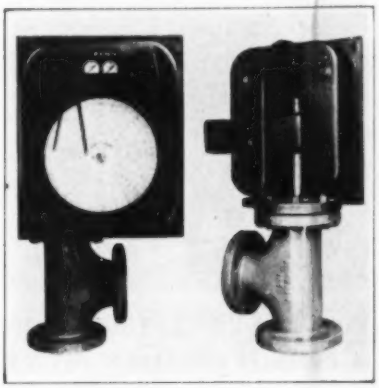
Insul-Mastic Names Two Regional Managers

The Insul-Mastic Corporation of America, Pittsburgh, Pa., has announced that Abner H. Bagenstose has been made Eastern Regional Manager, and John J. Miller has been placed in charge of the Midwestern territory. The two men will work from the home office of the Insul-

Mastic Corporation in Pittsburgh, Pa.

Mr. Bagenstose has been a part of the Insul-Mastic sales staff for five years. His original assignment with the Company was the refineries and chemical plants of the Texas Gulf Coast. In his new position, Mr. Bagenstose will cover the states from North Carolina to Maine and westward into Ohio.

Mr. Miller was formerly an Insul-Mastic service engineer. Part of his knowledge of coatings was gained through hard experience behind a spray gun. He will cover the territory from Ohio and Kentucky westward to the Dakotas.



Flow Meter with Pneumatic Transmission

917

Penn Industrial Instrument Corporation, Philadelphia, Pa., has announced that the Penn LINAMETER, variable area type flow meter, is now furnished with pneumatic transmission. The instrument is fundamentally linear and the air output signal varies directly with rate of flow. (Output range 3-15# standard, other ranges available.)

The Penn LINAMETER is an all metal, sturdily constructed instrument operating on the rotameter principle. The instrument is mounted directly in the pipe line like a valve and is suitable for measuring rates of flow of liquids, vapors or gases from 0.3 to 3 GPM minimum flow range to as much as 120 to 1200 GPM maximum. (Corresponding gas or steam flows depend upon pressure and temperature conditions.) It is produced in sizes from 2" to 8" with a wide choice of materials for meter bodies and internal metering components.

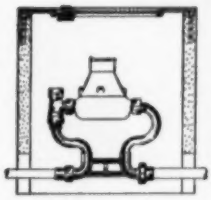
The instrument has a metering float which rides vertically up and down in a tapered metal metering throat inside the meter body. The connection between the metering float

PIONEERS ....of these TIME-SAVING ECONOMIES

When a meter-servicing chore seems to require more time and bother than it is worth, Ford engineers usually come up with a new idea to save time and cut costs. Each of the products in this space was pioneered by Ford to solve an expensive service problem. It pays to refer your problems to Ford FIRST.

RESETTERS

Until the Ford Resetter was developed the only way to raise a too-low meter was to dig up and remake the setting. The modern way to do the job is to remove the meter from between the old couplings, insert the Resetter and connect the meter between the flanged copper tubes.



COPPERSETTERS

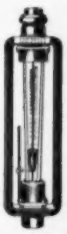
The Coppersetter is a complete meter mounting and has been widely adopted for outside meter settings in shallow and medium depth service lines. The word is copyrighted; there is no Coppersetter except that made by Ford.

RINGSTYLE COUPLINGS

The Ringstyle idea of putting the meter nut on the coupling body from the flange end permits designing meter couplings for attaching direct to iron pipe or copper tubing. There are savings in fittings, joints, labor and space.

TESTERATE INDICATOR

It is important to know the rate of flow at which a meter is tested. The Testerate Indicator shows the rate instantly, clearly and accurately. Introduced in 1938, there are almost two thousand in service.



THE FORD METER BOX COMPANY, INC.
FOR BETTER WATER SERVICES
Wabash, Indiana
FORD

HYDRO-TITE

DEPENDABLE JOINTING COMPOUND
Seals Bell and Spigot Water Mains
Economical—Effective
Over 35 Years Of Dependable Performance

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MAIN SALES OFFICE 50 CHURCH ST., N. Y. C.
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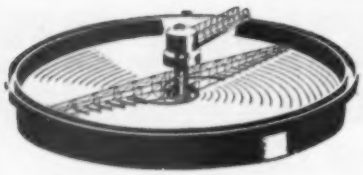
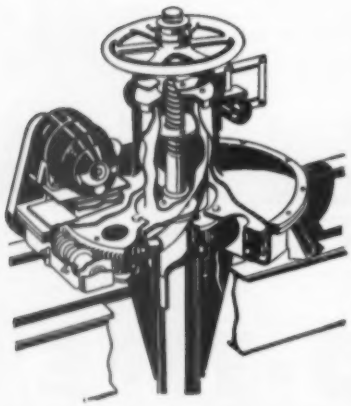


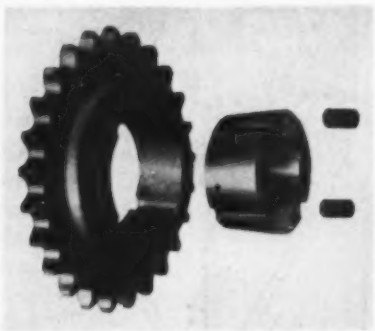
"Auto-Raise"
THICKENERS AND CLARIFIERS



One of the distinctive features of Hardinge Thickeners is the "Auto-Raise" driving mechanism, which automatically lifts the scraper away from the overload or obstruction in the tank bottom—eliminating costly breakdowns and delays. Bulletin 31-D-15.

HARDINGE
COMPANY INCORPORATED
YORK, PENNSYLVANIA · 240 Arch St. · Main Office and Works
New York · Toronto · Chicago · Hibbing · Houston · Salt Lake City · San Francisco

inside the flow stream and the instrument components outside is magnetic—there are no stuffing boxes or pressure tight bearings—and it is completely frictionless.



Roller Chain Sprocket Wheels With Taper Lock Bushings

918

Link-Belt Company, Chicago, Ill., has announced a new line of roller chain sprocket wheels with taper lock bushings, facilitating immediate delivery and rapid installation.

Without reboring, these stock sizes of sprocket wheels can be securely mounted on a shaft, equivalent to a shrink fit. Action of the taper lock bushing assures tight fit within the full range of normal shafting tolerances.

Set screws force and hold the split tapered bushing in the tapered bore of the sprocket wheel, causing it to lock tightly onto the shaft. The full length of the bushing supports the sprocket on the shaft.

Assembly and disassembly are easy. Turning set screws in removal holes pulls the bushing out of tapered bore and causes it to release its hold on shaft.

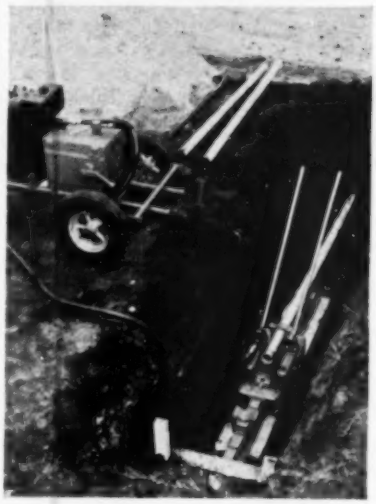
Link-Belt sprocket wheels with taper lock bushings for ½, ⅝, ¾, 1 and 1¼-inch pitch single-width chains are now available from Link-Belt distributors and factory branch stores.

FOR SALE
At a Tremendous Saving
NEW MODERN INCINERATOR

Morse & Boulger incinerator designed to burn 24 tons per 24-hr. period, oil fired with Diesel driven blower. All packed in boxes for erection. Price and detailed information on request.

DALTON SUPPLY CO.
719-16th Ave. Belmar, N.J.

FAST, EASY WAY
TO INSTALL PIPE...
AT LOWER COST



PUSH PIPE UNDERGROUND WITH A GREENLEE HYDRAULIC PUSHER

Here's the simple, cost-cutting way to install underground pipe. Speed your jobs with a GREENLEE Pusher. One-man-operated, portable, simple to operate. No tearing up of pavement . . . eliminates extensive ditching, tunneling, backfilling, tamping, repaving. Cuts job time to a fraction. GREENLEE Hydraulic Pipe Pusher often pays for itself on first job. Two sizes — model shown above for pushing 3/4" to 4" pipe. Larger unit, below, for pipe over 4", concrete sewer pipe and large drainage ducts. Power pump (as shown above) also available for extra ease and speed of operation.

GREENLEE

Write today for descriptive literature. Greenlee Tool Co., 2249 Columbia Avenue, Rockford, Illinois, U.S.A.

New, Easy Way to Label Pipes, Valves, Samples, Etc.

919

Labelon Tape Co., Inc., Rochester, N.Y., has developed a plastic Labelon "Write on It" tape that sticks without moistening to any clean, smooth surface.

All that is needed is the tape and any dry, blunt point, such as an ordinary lead pencil to bring out the writing. The pressure of the writing instrument used brings out the writing. Smudging is impossible, for the writing is not on the surface of the tape, but actually appears beneath a transparent outer layer of tough plastic.

The outer layer protects the writing against smudging, grease, dirt and most liquids. The tape also strips off cleanly and can be applied and reapplied an almost unlimited number of times.

Beeson Appointed Sales Manager for Belle Alkali

Diamond Alkali Co., Cleveland, Ohio, has announced the appointment of William B. Beeson, Jr., of Pittsburgh, Pa., as sales manager of Diamond's new subsidiary, Belle Alkali Company, of Belle, W. Virginia.

Mr. Beeson's sales career with Diamond, dating back to 1933, was interrupted only by World War II, when he served as a major in the U. S. Army Air Corps.

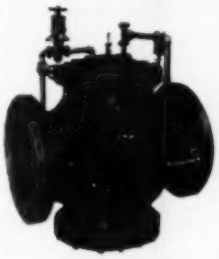
Originally assigned to Diamond's Cincinnati (O.) Branch Sales Office, Mr. Beeson was transferred in March, 1948, to the company's Pittsburgh Branch Office, where shortly thereafter he was promoted to the position of assistant branch manager.

Born in Uniontown, Pa., Mr. Beeson attended public schools there before enrolling at Mercersburg Academy, Mercersburg. After graduation he attended Washington and Jefferson College, Washington, Pa., where he received an A. B. degree in 1932.

PROTECT YOUR WATER SUPPLY
with
ROSS AUTOMATIC VALVES

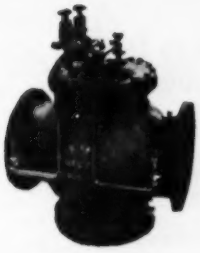
EFFICIENT REGULATION OF DISTRIBUTION PRESSURES IS A PROVEN METHOD OF CONSERVATION IN THE FIGHT AGAINST DIMINISHING WATER SUPPLIES

ROSS
1879



PRESSURE REDUCING VALVES

Maintains constant discharge pressure for all changes in rates of flow down stream.



COMBINATION PRESSURE REDUCING AND BACK-PRESSURE VALVE

BACK-PRESSURE VALVE

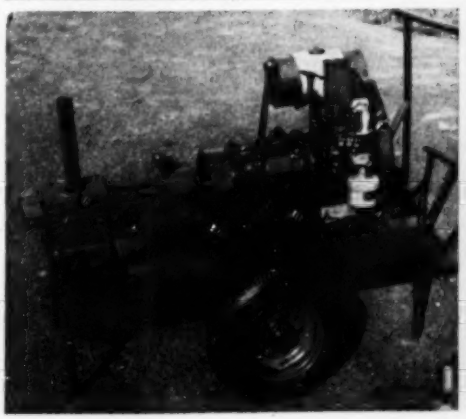
Maintains constant upstream pressure regardless of draft down stream.

OTHER ROSS PRODUCTS

ALTITUDE VALVES • FLOAT VALVES • RELIEF VALVES
HYDRAULIC BOOSTER PUMPS
STRAINERS AND SPECIALTIES

Write for Catalog #50

ROSS VALVE MANUFACTURING CO., INC.
4 OAKWOOD AVENUE——TROY, NEW YORK



GATE OPERATORS
—
PORTABLE
—
FOR STANDS & UNDERGROUND GATES—MOTOR TRUCK MOUNTED
PAYNE DEAN & CO.
CLINTON, CONN.

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

ROTO-TROL 940

CONTROLS that are dignified by a background of long experience and infallible operation. *ROTO-TROL 940* controls pumps, valves, alarm circuits, etc., from one float. Starting and stopping positions, rising and falling, can be set as required. Each circuit is independent. Mercury switches with snap action are used. *ROTO-TROL 940* can be easily set on the job.

Write for Bulletins

Water Level Controls Division

HEALY-RUFF Company

783 HAMPDEN AVE., ST. PAUL 4, MINN.

LEADITE

The Pioneer Self Caulking Material for C. I. Pipe

4 REASONS

why more miles of cast iron water mains are joined with LEADITE than with any other melted self-caulking material:

- MELTS EASILY
- GOES FARTHER
- SAVES TIME, LABOR, COST OF MATERIAL
- MAKES A GOOD TIGHT JOINT THAT IMPROVES WITH AGE!

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

Literature & Catalogs

Instrumentation for Water, Sewage and Industrial Waste

920

Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., has just published a bulletin on **Instrumentation for Water, Sewage and Industrial Waste Treatment.**

The bulletin describes the role of instruments in modern treatment processes. Liberally illustrated with drawings and photographs of existing installations, the bulletin is a guide for organizing engineering thoughts on instrumentation of water, sewage and industrial waste treatment processes. Literature references are included so that any subject such as "flow" or "chlorination" can be pursued further for instrumentation details and data.

Rubber Seat Butterfly Valves

921

Henry Pratt Co., Chicago, Illinois, has available an 82-page catalog of **Rubber Seat Butterfly Valves.**

The catalog discusses, in great detail, the principles of the Pratt design, construction details, application pictures, various types of operating mechanisms, special purpose valving, filter plant valving, control systems, and suggested specifications.

Profusely illustrated with photographs and blue-print type drawings, it also contains technical data on flow and torque.

Pipe Cutting

922

Beaver Pipe Tools, Inc., Warren, Ohio, has recently produced a new

WANTED
SUPERINTENDENT AND OPERATORS

wanted for new 8 MGD Sewage Treatment Plant. Positions available September 1953. Apply Division of Sanitation, Fairfax County, Fairfax, Virginia.

INCREASE SEWAGE PLANT CAPACITY WITHOUT CAPITAL COST!

WHAT IS IT?

- BIONETIC is a dry powder of preserved beneficial groups of micro-organisms that accelerate natural biological action.

WHAT DOES IT DO?

- BIONETIC can save money on sewage plant problems including odor control, increased sludge digestion capacity, and scum blanket control.

INTERNATIONAL ACCEPTANCE:

- BIONETIC is successfully used by hundreds of municipalities, industries, resorts, and institutions.

For FREE Literature Write:
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Reliance Chemicals CORPORATION
P. O. BOX 6724 HOUSTON 5, TEXAS

Sign of LASTING SECURITY

Continental . . . sign of fence economy, stretches your fencing dollar by protecting persons and property years longer than ordinary fence. Continental combines galvanized fabric and better engineered fittings with sturdy fence installation. Investigate Continental before you specify any other chain link fence.

*Tr. Mrks. Reg. U.S. Pat. Off.

CONTINENTAL STEEL CORPORATION
Kokomo, Indiana

Please send FREE copy of "Planned Protection"—complete manual on property protection.

Name
Address
City State

CONTINENTAL STEEL CORPORATION

envelope enclosure explaining an improved principle in pipe cutting.

The folder describes how Beaver's new No. 2 and No. 4 Pipe Cutters are constructed so that the cutting wheel is fed directly into the pipe. This allows easier, quicker cutting.

Diagrams and drawings illustrate this point. The folder also includes size and price information. The back page is devoted to Beaver's new Model-D Aluminum Power Drive. This new Beaver unit weighs 100 pounds and is easily carried by one man.

Water, Sewage and Industrial Waste Equipment

923

Link-Belt Company, Colmar, Pa., has just released a booklet on **Water, Sewage and Waste Treatment Equipment.**

The booklet, composed of a series of recent advertisements of the company, give case histories of how different water, sewage and industrial waste treatment problems were solved. It also lists other pieces of equipment made by Link-Belt and the addresses of all the Link-Belt sales offices in the United States, Canada, Africa, and Australia.

Nephelometers

924

Coleman Instruments, Inc., Maywood, Ill., has just published a booklet entitled **"Nephelometry, a short cut to Precision Chemical Analysis"** that explains in simple diagrams how a nephelometer works by measuring light reflected from particles in suspension.

This folder also shows why the Coleman Nephelometer can eliminate 5 out of 7 steps necessary to haze or turbidity measurements. Only preparation and precipitation of the sample is needed, no filtering, washing, drying, cooling or weighing is required to get exact haze data.

Gear Pumps

925

Schutte and Koerting Co., Cornwells Heights, Pa., has just published a bulletin on **SK Gear Pumps.**

This 24-page, 2-color bulletin describes all standard pumps, illustrates and briefly describes some of the special types engineered to meet unusual requirements.

It describes the design, construction, and operation of these units.

(Continued page 122A)

Figure It Out For Yourself...

...IT'S SURE TO SHOW A PROFIT!

No matter how you figure it, a Royer Sludge Disintegrator will make a profit for you. In fact, you will profit two ways. Rather than having the expense of burning, burying or hauling away sewage sludge, you can process it into a source of income as a readily saleable fertilizer.

The operation is a simple one. Sludge cake direct from the drying beds, even with moisture content as high as 56%, is shovelled into the low hopper of the Royer. A completely shredded, pulverized and aerated product, free of all contamination, is discharged to bags, pile or truck.

Join the many sewage plants that have changed their sludge disposal from an expense to an income. Write for complete details on sizes available in electric motor, gasoline engine or belt-to-tractor driven models.

Shown above, a Royer Model NSB-4 at a Georgia sewage disposal plant.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

Inspection
Repairing
Painting

Elevated Tanks and Standpipes

VIRGINIA ERECTION COMPANY

Constitution Blvd.

P.O. Box 387 Rochester, Pa.

BELL JOINT LEAK CLAMPS

GASKET SEALER COMPOUND

CHARCOAL CAST IRON BOLTS

Also Anchored Glands for mechanical joints to replace socket clamps.

Write for information

H. Y. CARSON COMPANY

1221 Pinson St. Birmingham, Ala.

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

NO OTHER PIPE JOINT Can Equal BOND-O

- *In First Cost*
- *In Uniformity*
- *In Performance*

A careful survey of pipe joint costs will surprise you as to how much you can save with BOND-O. The low installation cost as well as a perfect performance record proves that nothing else equals BOND-O.

This self-caulking compound is accurately formulated and is used for jointing cast iron bell and spigot pipe.

Machine-blended by a unique process, BOND-O makes joints that are uniform and trouble-free. No BOND-O failure has ever been reported.

Write for literature today.

NORTHROP & COMPANY, INC.
SPRING VALLEY, N. Y.

TRANSITE FILTER BOTTOMS
CUT YOUR FILTRATION COSTS

Check
THESE FEATURES:

- ✓ *consistently-uniform backwash*
- ✓ *long-lasting materials*
- ✓ *economic installation*
- ✓ *strong, stable support*

• Made so gravel cannot clog or obstruct ports, these strong, durable transite filter bottoms are stable under all conditions. Easily assembled with only a screwdriver in 5 minutes.

OFFERS SUPERIOR FILTER PLANT PERFORMANCE AT LESS COST
Write for More Information
FILTRATION EQUIPMENT CORPORATION
P. O. BOX 1331 • ROCHESTER 3, N. Y.

M-SCOPE Pipe Finder

LIGHTWEIGHT MODEL

One Man Operation

Catalog No. 25G on Request

JOSEPH G. POLLARD CO., INC.
Pipe Line Equipment
New Hyde Park New York

(*Continued on page* 121A)

Information explaining how to select the proper pump for a specific application is included.

The bulletin uses cut-away drawings, dimension drawings, photos of pumps in action, tables of capacities, pressures, dimensions, and operational data to supplement the crisp text.

Ratochlor Chlorine Dispenser

926

Fischer & Porter Company, Hatboro, Penna., has just released a catalog that describes the new solution feed dry vacuum type Fig. 1050 Ratochlor Chlorine Dispenser, giving specifications covering dispensing rates from 0.5 PPD to 1000 PPD. Also found in the catalog are illustrations of component parts, a complete flow diagram of the dispenser, and pictures and diagrams of chlorine dispenser installations.

Flotation Unit

927

F. S. Gibbs, Inc., Newton Lower Falls, Mass., has available a bulletin on the **Gibbs Flotation Unit.**

The bulletin states that the unit was designed for the dependable and economical clarification of industrial wastes and water supplies. The principles of flotation and the advantages of the Gibbs unit are discussed on the first two pages. The center fold of the bulletin shows the plan of the unit along with front and end elevation diagrams.

The rest of the bulletin contains a schematic flow diagram of the unit and the air induction assembly and each diagram is keyed to descriptive text.

Sewer Cleaning Equipment

928

Flexible Sewer-Rod Equipment Co., Los Angeles, Calif., has available a catalog entitled **Why Preventative Maintenance?**

This 40-page catalog covers the complete line of equipment made by Flexible. It is profusely illustrated with photographs and drawings that not only show the equipment but also that equipment in operation. Features and advantages of all the different types of cleaners and accessories are discussed and illustrated. Instructions on the use of the equipment are also given.

Water Works Service Gate Valves

929

Chapman Valve Manufacturing Company, Indian Orchard, Mass., has just published a bulletin on **Recommended Specifications, Iron Body Bronze Mounted Gate Valves for Water Works Service.**

This attractively bound 34-page bulletin gives complete information on: General specifications for gate valves; Detailed specifications on double disc, inside screw gate valves, solid wedge inside screw gate valves, outside screw and yoke valves; Manual, hydraulic, electric gate valve operation; recommendations; and material specifications. The bulletin is amply illustrated with photographs and line drawings.

Feeder Catalog

930

Hardinge Company, Inc., York, Pennsylvania, has just published a new 12-page catalog on **Regulating Type Feeders.** The catalog covers design details, capacities, dimensions and application of Hardinge Constant-Weight Feeders, Weight-Measuring Feeders, Volumetric Belt Feeders, Disc Feeders and Volumetric Non-Flooding Drum Feeders. These feeders are used to control the rate of withdrawal of materials from bins or hoppers and discharge them to conveyors or subsequent processing equipment. One or more of the Hardinge regulating feeders satisfy most feeding requirements in all industries where solid materials are handled.

Pressure and Vacuum Gauges

931

Minneapolis-Honeywell Regulator Company, Philadelphia, Pa., has just published a new catalog that describes many types of **Pressure and Vacuum Gauges** used to measure vacuums as high as 10-11 mm of mercury and pressures as high as 150,000 psi.

The 32-page catalog covers indicators, recorders, pneumatic and electric controllers and pneumatic transmission. Information is presented in tabular form for ready reference.

Concrete Pipe

932

Universal Concrete Pipe Co., Columbus, Ohio, has issued a new folder describing the complete line

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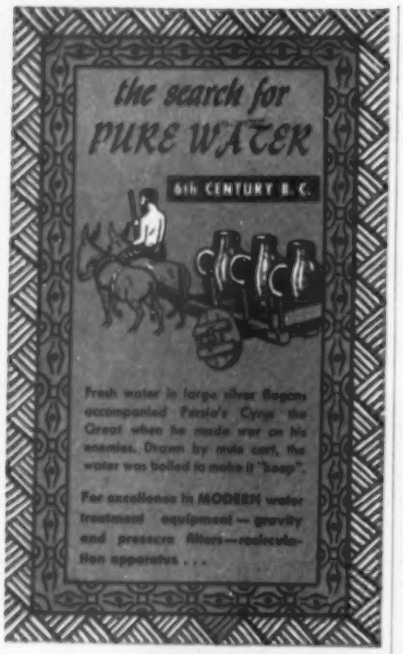
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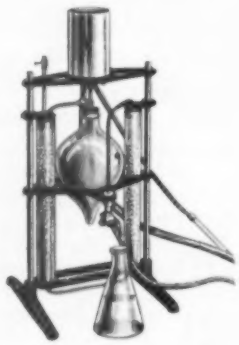

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Package Water Conditioner

933

The Permutit Company, New York, N. Y. has just issued a bulletin on **Permutit's Package Water Conditioning Plant.** The bulletin describes the unit as an extremely versatile and self-contained unit, designed to chlorinate, coagulate, clarify, filter, neutralize, de-alkalize and soften raw water supplies.

The bulletin lists the component parts of the complete water conditioner, details the principles of operation, gives ratings, capacities and sizes and illustrates some typical installations.

Valve Lubricants, Fittings and Methods

934

Rockwell Manufacturing Company, Pittsburgh, Pa., has just published a new, comprehensive 12-page bulletin describing **Lubricants, Lubricant Fittings and Lubrication Methods** for Rockwell-built Nordstrom valves.

Three major types of lubricant—Rockwell Hypermatic, Nordcoseal and Lubricant DC-234 — are described. Their functions are listed in detail. A "selection chart" is also offered showing which lubricants are recommended for use with a variety of fluids.

The bulletin also illustrates and briefly describes the new Rockwell bulk and gun tube lubricants along with stick lubricants, bulk lubricant cans and Hypreseal steam packing for use in the packing injector fittings of Nordstrom Hypreseal valves.

A special feature of the new bulletin is an illustrated outline of the three functions of a lubricant in Nordstrom valves — lubrication of the seat, provision of an impervious seal around each port under pressure, and provision of the hydraulic means for lifting the plug from its tapered seat.

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description of three styles of "Sealdport" lubricant grooving used in Nordstrom valves, all three illustrated with phantom exploded views of the valves.

The new Rockwell combination button head fitting and lubricant screw is illustrated along with Rockwell bucket pump, gun and gun accessories.

The bulletin also has detailed, photo-illustrated instructions for servicing of all Nordstrom valves.

Summator

935

Simplex Valve and Meter Company, Philadelphia, Pa., has available a bulletin on the **Simplex Summator.**

According to the bulletin, Summation is becoming increasingly important, where plant control systems are concerned, to find ways of totalling or summating the flows through two or more lines and instantaneously indicating, recording or registering these combined flows on one instrument.

The bulletin gives a complete description of the summator and shows the wiring diagrams for the summation of four meters and for a master summator used with two groups, each of four or more meters.

Elevated Steel Tanks

936

W. E. Caldwell Co., Louisville, Kentucky, has available a bulletin on **Elevated Steel Tanks.**

This attractive 16-page bulletin discusses: Double ellipsoidal tanks with tubular columns; Ellipsoidal-bottom tanks with conical roofs; Hemispherical bottom tanks; Flat bottom tanks; and Standpipes and reservoirs.

Features of the tanks such as, piping, accessories and frost protection are discussed. The bulletin is amply illustrated with photographs of actual installations.

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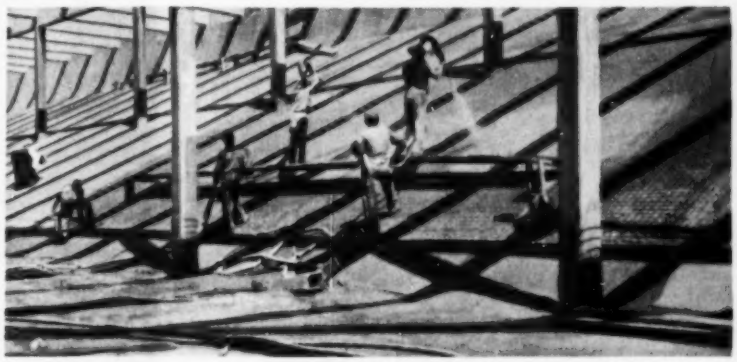

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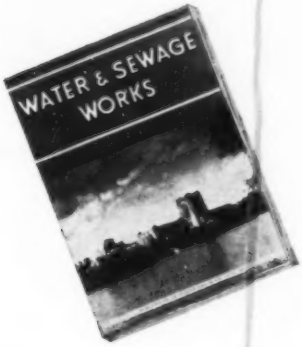

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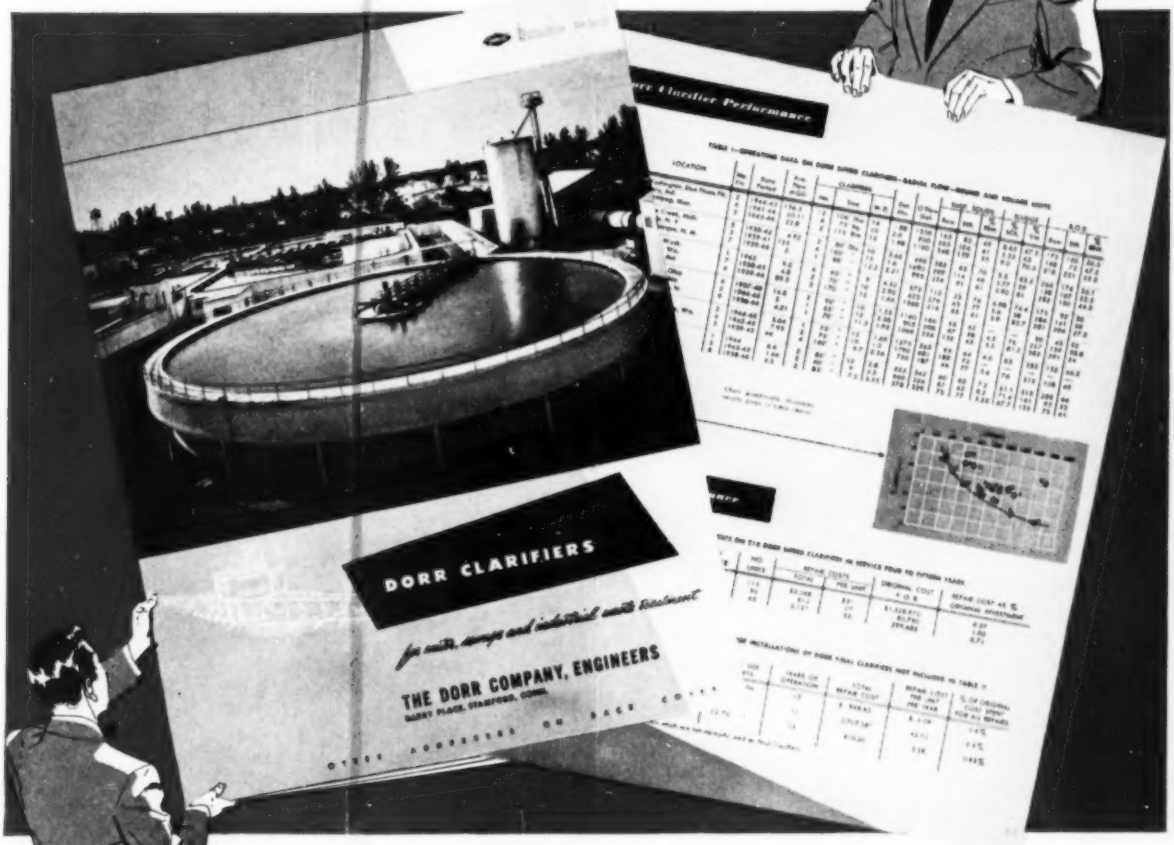

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